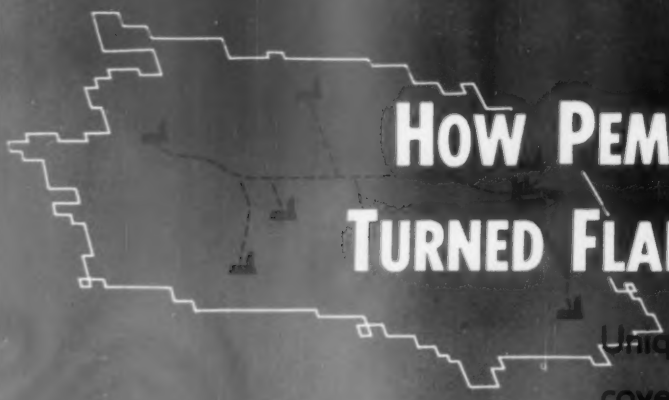
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY NOVEMBER 7, 1960



How Pembina Operators Turned Flare Gas Into Cash

Unique $20-million project covers 300 square miles . . . . . p. 118

Economy effort shows up in profit picture ▸ 91

Oil spending abroad tops U.S. again ▸ 96

California eyes new offshore leasing plan ▸ 100

New stimulator keeps wells producing ▸ 151

Needed: A simpler geophysical approach ▸ 208

DUAL PUMP POWER

In today's deeper completions rugged reserve power is required for successful fracturing and cementing. When you send Halliburton to service your well, chances are the trucks will be equipped with *two* of the industry's mightiest power packages . . . the twin T-10 or the HT 400. Only with Halliburton do you always get Dual Pump Power which means dual pump *dependability*. Dual Pump Power is not new with us. To meet your requirements we've been providing it for over 35 years.

Halliburton COMPANY

DUNCAN, OKLAHOMA

OIL AND GAS JOURNAL
Vol. 58, No. 45

Contents November 7, 1960

THE WEEK'S NEWS

General Interest:
Oil's Economy Efforts Are Showing Up in Profits ... 91
Marketing Trend: Motorist Is More Price and Credit Conscious ... 92
Domestic Industry Is Rebounding, Security Analysts Told ... 94
Depletion Provision Vital, Interior Department Official Says ... 95
Free-World Capital Expenditures for Oil on Upswing Again ... 96
Settlement Assured in Richardson LPG Storage Patent Suit ... 99
Natural-Gas Volumes, Revenues Set New Records Last Year ... 104
Proposed Resid-Import Changes Draw Heated Comments ... 107

Processing:
Humble's King Ranch Gas Plant Is World's Largest ... 93
Validity of Tests for MS Oil Debated at SAE Meeting ... 98
Processing Briefs ... 102
Baytown Refinery Vote Will Decide Union Affiliation ... 107
California Standard Puts Hawaiian Refinery on Stream ... 109
Journal Study Shows Slight Dip in Southwestern Refinery Runs ... 112

Pipelining:
More Pipeline Hookups Planned for Air Force Bases ... 97
Coal-Slurry Pipeline Plans Move Closer to Reality ... 103
No Quick Decision Expected on Montreal Pipeline ... 104
New Device Can Install Plastic Liner in Pipeline ... 106
Pipeline Briefs ... 106

Foreign News:
Argentina Opens Reserved Oil Areas to Private Development ... 113
Private Companies Meet Cut-Rate Russian Prices in India ... 114
Indonesia Seeks New Terms From Oil Companies ... 115

Drilling-Production:
Texas Supreme Court Blocks New Attack on Small-Tract Drilling ... 92
Interior Abandons Plan to Increase Public-Land Fee ... 93
Drilling Contractors Moving to Get "Fair" Deal From Producers ... 102
Well Spacing to Be Factor in New Louisiana Allowable Formula ... 109
British Columbia Wildcat Sets Canadian Drilling Records ... 110

Exploration:
California Considers Offshore Leasing Changes, Sale Is Delayed ... 100
Deep Edwards Strikes Put South Texas in Spotlight Again ... 205
Needed: A New Approach to Geophysical Methods of Finding Oil ... 208
Exploration Outlook ... 212

REGULAR FEATURES

Advertisers' Index ... 235
Book Review ... 166
Calendar of Events ... 82
Classified Advertising ... 232
Deaths ... 225
Drilling Contractors ... 202
Drilling Statistics ... 228
Editorial ... 89
Equipment Men ... 198
Exploration Highlights 205
Foreign News ... 113
Foreman's Page ... 159
Journally Speaking ... 87
Markets ... 231
New Equipment ... 185
On the Job—Pipelining 173
Personals ... 222
Production ... 229
Refinery Cost Indexes 124
Refining Statistics ... 230
Statistical Summary ... 227
Technical Questions ... 155
The Journal Said ... 87
They Say ... 77
Trade Literature ... 195
Watching Washington ... 101
Who's Who in Oil ... 222

Technology-Operation section on next page →

The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1960 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

TECHNOLOGY—OPERATION

Refining-Processing

Liquid-Recovery Plants Profit Pembina Producers 118
By H. C. Bozeman
Eight satellite field recovery units are the key to successful flare-gas conservation at Pembina field.

Refinery Cost Indexes 124

Here's Where We are on Gas Engines 129
By H. C. Bozeman
Development of gas engines over the past 25 years has increased thermal efficiency to 37% and reduced floor area to 15% of the original.

Japan's Petrochemical Program is Growing 139
By K. Kurokawa
Japan's petrochemical industry has achieved its first 5-year program and is looking toward the second.

Photodrawing Aids Plant Engineering 142
By R. J. Tiller
Photodrawing, the technique of using photographs with drafting additions, conveys engineering information in the same manner as orthographic engineering drawings.

Photography is a Good Maintenance Tool 147
It can replace written instructions and drawings, making it unnecessary to rely on verbal instructions and crude sketches to relay information to field crews.

Questions on Technology 155
How much contamination is allowed in products lines?

The Foreman's Page 159
What happens in catalytic cracking?

Drilling-Production

How Recoveries are Increased in Lake St. John Unit 121
By Paul R. Waddle
Unitized operation plus dry-gas injection is yielding 35% oil recovery, and 85% wet-gas take.

Air Hammers Cut Drilling Costs in Big Holes 125
By J. E. Eckel, S. D. Murray, B. M. Van Meter, and W. E. Liljestrand
Field tests of a new 8-in. hammer drill prove that it can extend percussive air and gas drilling to hole sizes as large as 13¾ in.

How to Reduce Drilling Costs—6 132
By Preston L. Moore
How to select bit weight and rotary speed.

New Stimulator Keeps Wells Producing 151
By Carl Lawrence
The tool treats wells with a mild backflush to prevent perforations from plugging.

Oil-Well Pumping—21 163
By Joseph Zaba
Design of sucker-rod strings (conclusion).

Pipelining

Gas Hydrates: A Practical Control Method 166
By L. E. Connealy
Injections of methanol are used by Texas Eastern Transmission Corp. to prevent the formation of gas hydrates.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Nov. 7, 1960

Drilling contractors complain of a new squeeze:

Bargain-basement footage prices have benefited producers and cut into contractors' income for several years.

Producers now are applying pressure for new concessions on day work, speed, slant-hole drilling, and payment to suppliers that contractors find unpalatable.

Contractors complain the trend adds to their costs and risks with no extra compensation. They have named a task force to study the practices (p. 102)*.

▼ ▼ ▼

Oil companies generally enjoyed a good third-quarter business, stockholder reports now coming out show. Many firms were able to offset poor showings earlier in the year and now are ahead of last year.

Explanation for the brighter outlook: Firmer prices for crude and products, larger volume of natural-gas and petrochemical sales, and more efficient operations (p. 91).

Here's how a panel of petroleum analysts view the oil industry: The domestic segment has solved many of its problems and is more attractive to investors than it has been for the last 2 or 3 years. Outlook for earnings growth on foreign operations, however, is less certain (p. 94).

▼ ▼ ▼

Oil industry may become a whipping boy again regardless of who wins the presidential election.

If it's Nixon, especially if he carries Texas, Johnson and Rayburn may become less aggressive defenders of percentage depletion when that issue crops up in Congress.

If it's Kennedy, he is commmitted to pressing for a "review" of percentage depletion. And he favors a fuels policy study.

The election will have an effect on Congress too, even though no widespread change in membership is likely in either house, because most congressmen keep alert to shifts in pub-

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

lic sentiment.

Keep an eye on how regulatory agencies shape up once the election is over. They are important.

The actions of the agencies, such as FPC, FTC, and the Justice Department's antitrust division, can have a big impact on an industry.

Because of vacancies and interim appointments, a new president will be able to name three new men—a majority—to both the FPC and the FTC next year.

▼ ▼ ▼

A drilling device capable of sinking a test hole in the moon is being developed by Hughes Tool Co.

The 5-ft. high tool weighs 60 pounds (10 pounds on the moon) and will penetrate either granite or dust. Hughes is doing the research under direction of the Jet Propulsion Laboratory of the California Institute of Technology.

Target date for its use, according to Hughes, is 1963. Its purpose is to analyze samples of deeper lunar material.

New drilling-depth record for Canada has been set by crew on Cal-Standard D-61-L at Fording Mountain 50 miles north of Fernie in southeastern corner of British Columbia.

The wildcat has reached depth of 16,056 ft. and may be taken still deeper. The old record was 15,283 ft.

▼ ▼ ▼

Long Beach's city council has taken the first step to leasing the eastern section of big Wilmington field, the subsidence headache of Long Beach harbor.

The council has asked city attorney to clarify legal steps necessary. It's a good bet it will be years before some kind of drilling plan can be hammered out. And then the question will have to go to the electorate.

Key to whether the city will press the study will be just how well subsidence controls work in the western part of the field. At last report the giant water flood was retarding subsidence.

Pressure is building up in Texas for stronger anti-pollution laws. And Texas oil producers can look for the next session of the legislature to do something about it.

Widespread complaints of pollution were registered from all parts of the state last week before the meeting of the Texas Water Conservation Association. Major blame for pollution was put on the small operator who is gone when damage is discovered and on the present law preventing action until pollution is a fact.

Problem of internally protecting pipeline in place may be near solution.

A device capable of installing a plastic liner inside a pipeline has been invented by two Pan American employes. Still unsolved is what material to use for the liner (p. 106).

Product pipelines to 22 air bases are saving the Government $3 million a year. This will increase when the seven lines now planned or being built are completed. The system then will total more than 500 miles and will deliver from 1,500 to 6,500 bbl. daily to each base (p. 97).

▼ ▼ ▼

Signal Oil & Gas has decided to build a grass-roots refinery at Signal Hill rather than try to rebuild its old plant which was damaged by fire in 1957.

The new plant will have a capacity of about 20,000 to 25,000 bbl. daily. Design will permit expansion to 50,000 bbl. later. Construction will start during first half '61.

Gleanings from panel at WPRA's El Dorado sessions:

Trend in catalytic reforming is more toward regenerative type of operation. This in turn means lower operating pressures. One company reports it gets about 80% of previous catalyst life after each regeneration and can regenerate the catalyst three or four times on this basis.

Reforming capacity presently is about 20% of crude capacity, should increase to 25% by 1965 and ultimately hit 45%.

▼ ▼ ▼

New survey on American motorist by Du Pont shows:

Average driver travels 12,300 miles a year and 14% of this or 1,700 miles is on a vacation trip.

Motorists are becoming increasingly cost conscious both on buying gasoline and oil. Of those who buy regularly at the same station, 27% now give price, credit, or premiums as the reason compared with 17% in 1952.

Buying by the tankful is most popular (70%) and the trend is toward regular. For the country as a whole 58.2% now usually buy regular and 38.6% premium compared with 48% regular and 40.9% premium 8 years ago.

Use of credit cards also is gaining—12% used them in 1952 but 24.5% now take advantage of credit.

Dealer turnover at company-owned stations is showing a slight increase for the first 6 months of 1960.

Of 107,800 stations, dealers at 3.7% quit for reasons beyond the control of the supplier or dealer and 10.2% quit for other reasons. Comparable figures in 1958 were 3.2% and 9.8%, according to an API survey.

Market Memo

Nov. 7, 1960

Product markets are quiet and confused.

Every buyer figures on being able to get what he wants the moment he wants it. Buyers thus are under no pressure to compete.

But gasoline markets still are in better shape than usual for early November. Trend of prices from here on, however, will depend on what happens to demand.

The crude market is still tight, and there's a strong rumor in the trade that the price of West Texas sweet and intermediate crudes may get as much as a 12-cent hike.

Middle distillates are firm in the Gulf Coast at posted prices, despite East Coast downward price adjustments which have widened the disparity between Gulf Coast No. 2 and East Coast prices. Only cold-weather demand can end imbalance.

Gulf Coast prices are static.

There have been no recent cargo sales to test current posted price of 11.25 cents for 92-RON gasoline.

Middle distillates are strong at posted 8.25 cents with no inclination on part of refiners to discount.

A strong demand continues for products moving out of Group 3 for northern shipment via Great Lakes Pipe Line.

Gasoline prices held firm through October and are showing no signs of changing now. The posted price of 12.50 per gallon for 91-RON, while subject to discounts of one-quarter cent for limited sources, is considered firm for the season.

Middle distillates are marking time, waiting for colder weather to spur demand. Both No. 1 and No. 2 are firm at posted levels of 10 and 9 cents respectively.

Chicago markets are holding well. Products being offered at discounts of one-quarter cent per gallon have not affected posted prices.

Posting of 12.625 cents for 92-RON gasoline, while subject to one-quarter cent discount, is considered pretty good for Chicago.

Middle distillates need colder weather. No. 1 and No. 2 are holding firm at posted levels of 10.25 and 9.50 cents.

On the river, a few inquiries are being heard for No. 2 but buyers for up-river movement are not interested except at bargain prices. Gulf Coast low of 8.25 cents per gallon, f.o.b. mid-river terminals, is a discount price, considering the calendar.

OVER 190 YEARS

Combined *Service*

GARDNER-DENVER

Since 1859

SUPPLY

BOVAIRD

COMPANY

SINCE 1871

GARDNER-DENVER PUMPS

SALES · SERVICE · PARTS

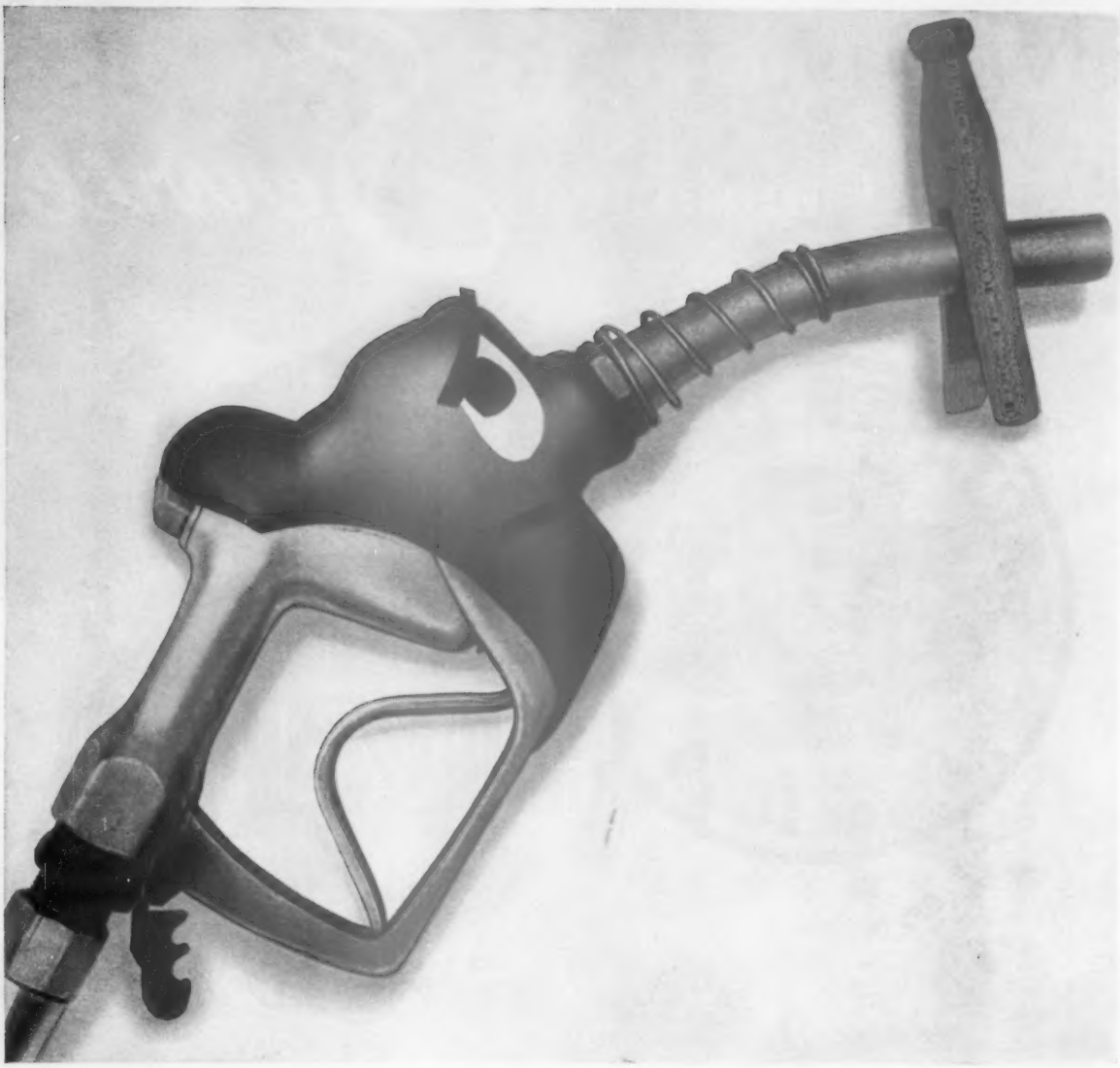
AVAILABLE THROUGH OUR 29 OFFICES AND STORES

Buy from

Bovaird

PESA

PARTNERS IN PETROLEUM PROGRESS



Low-cost way to sweeten gasolines

In many refinery stocks, you can convert mercaptans to less odorous sulfur compounds with Du Pont Antioxidant No. 22.

This type of treating can produce a doctor sweet gasoline, and may save money for you in several ways.

You may save equipment costs, since AO-22 sweetening requires little more than a modification of existing equipment.

You may save on additional chemicals and on regeneration expenses—and you don't lose any gasoline or octane numbers in the process.

You will eliminate the chance of contamination by sulfur or copper, because sweetening with AO-22 does not require their use.

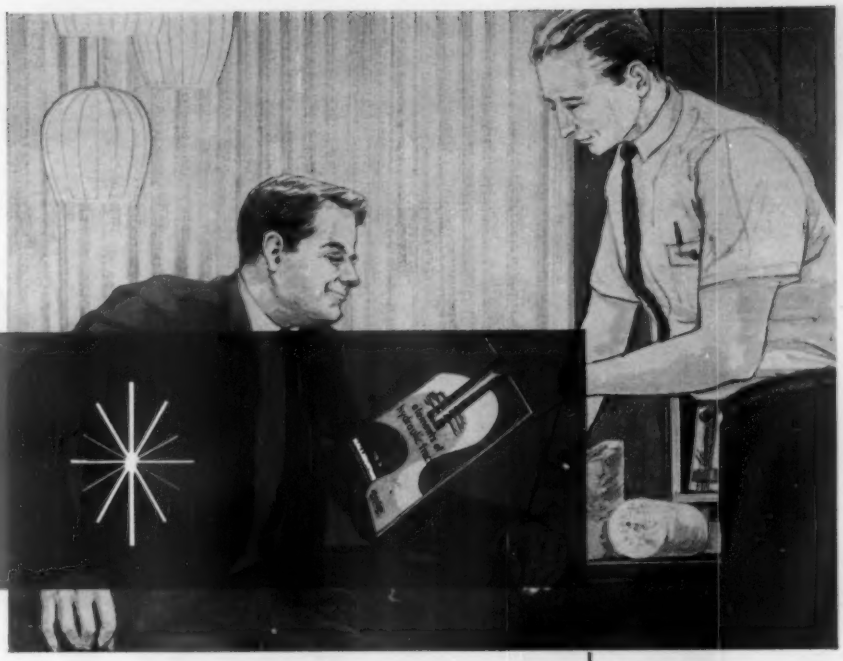
Stabilizing, too And finally you combine sweetening *and* stabilizing at one time. AO-22 retards gum formation and protects the quality of your gasoline in storage.

Figure the economics for yourself, or ask us to. Contact your Du Pont representative, or write to: E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living . . . through Chemistry

Lead Antiknock Compounds
and other PETROLEUM ADDITIVES



MAKE CONFIDENT FRACTURING DECISIONS

WITH HALLIBURTON

planning
products
performance

Begin programming your next fracturing treatment by calling in a Halliburton man. He will supply sound, seasoned advice to assist you in making profit-wise decisions.

His suggestions and ideas will represent the best combined thinking of the entire Halliburton fracturing team which is always ready to help *you*.

YOUR DECISION

TO CHOOSE THE BEST
OIL BASE FRACTURING FLUID

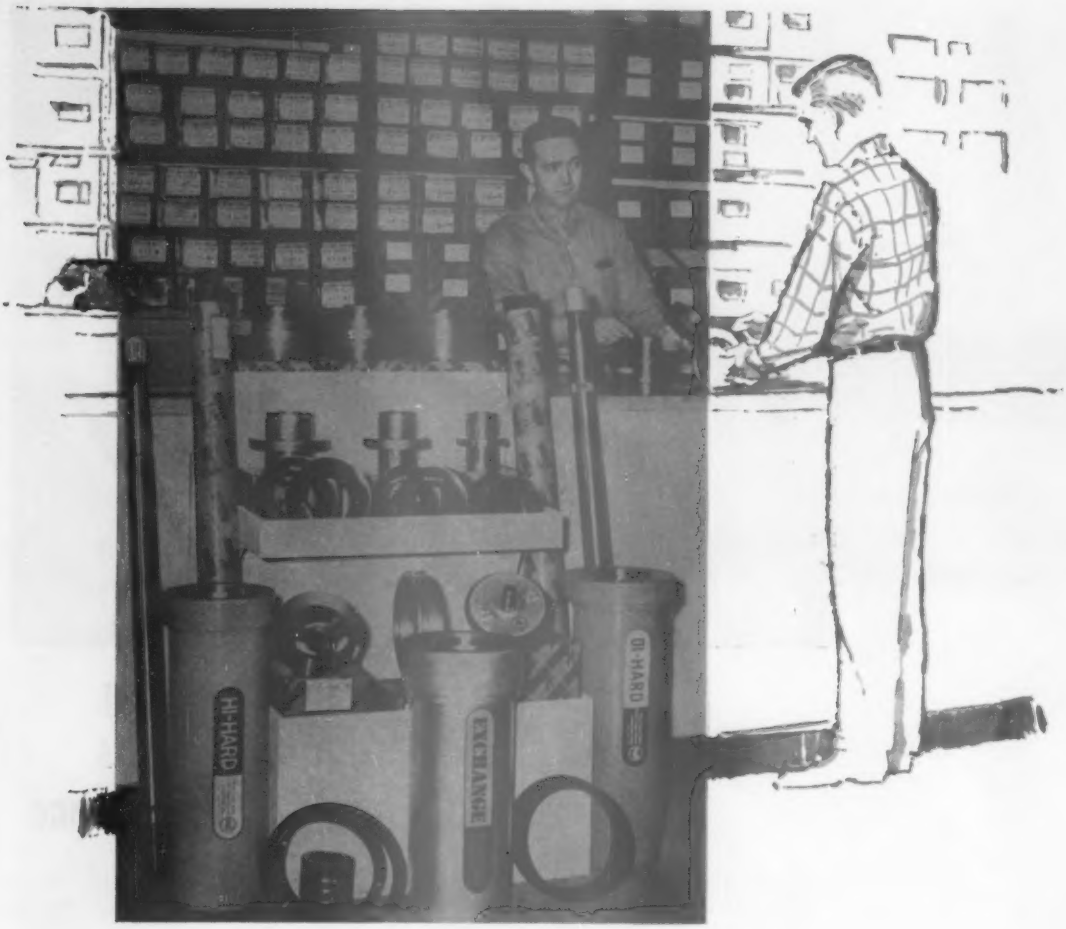
Your Halliburton man has information you need to make the best choice. No other service company has longer experience in oil-base fracturing. Halliburton effectively employs crude, refined, gelled and emulsified oils . . . and acid-oil mixtures. From this complete selection of fluids — *and a thorough knowledge of their application* your Halliburton man can provide information you need to make a confident fracturing decision.

KNOW ALL THE FRACTURING FACTS! *GET THEM FROM HALLIBURTON*

a working partner
in your fracturing
operation . . . the
HALLIBURTON FRACOMETER
. . . ask about it !

FRACTURING SERVICES

Halliburton
COMPANY • DUNCAN, OKLAHOMA



When you need 'em... "Oilwell's" got 'em

–and they'll be the best fluid end parts you can buy anywhere!

Genuine "Oilwell" replacement parts are made to the same high standard of quality and workmanship as you get in the original "Oilwell" pumps.

They are designed and engineered to exacting specifications for your equipment. And each part is carefully packaged in protective containers to assure its being in clean, ready-to-use condition when you put it in your pump.

For the *continued* efficient performance and low-cost operation of your pumps, use only genuine "Oilwell" fluid end replacement parts. Ask for them by name. Genuine "Oilwell" fluid end parts and a wide variety of other maintenance supplies are available at your nearest "Oilwell" store.

USS, "Oilwell", Wilson-Snyder, Di-Hard and Hi-Hard are registered trademarks

**They're Genuine "OILWELL" Quality—
your assurance of satisfaction!**

DI-HARD Liners give longer service but cost no more.
HI-HARD Liners can be exchanged and rebuilt.
HI-HARD Piston Rods have *hard* surface on high tensile core.
HI-HARD Chrome Piston Rods are extra resistant to corrosion.
"4-on-1" Wilson-Snyder Pistons have the never-wear-out body.
Valves and Seats have more metal-to-metal impact area.
Rod Packing, Liner Packing and Gaskets are made to rigid specifications.

USS **Oil Well Supply Division of United States Steel**

Executive Offices: Dallas, Texas
Export Office: 30 Rockefeller Plaza, New York 20, N.Y.

THREDKOTE 701

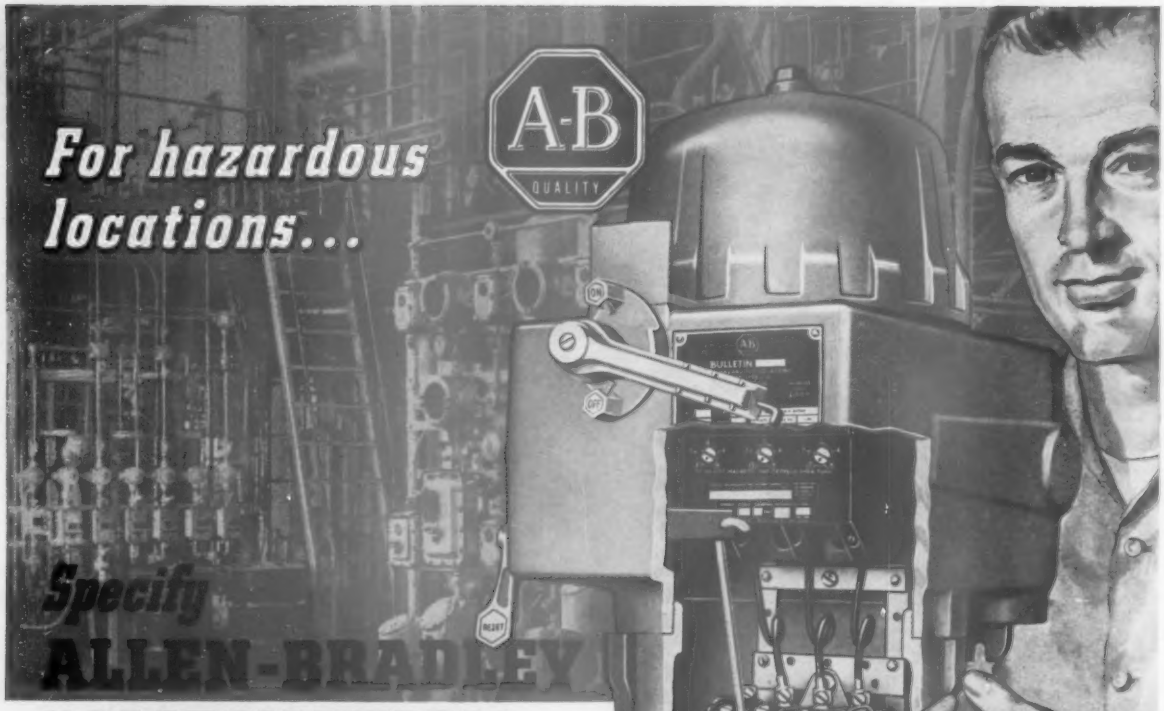
is the tool joint Thread Compound that contains **60% zinc**

Humble THREDKOTE 701 gives you the lubrication and protection you need and want. The zinc effectively guards against metal-to-metal contact and prevents galling as the string is run. THREDKOTE 701 maintains its quality and assures protection under the most rugged running conditions.

Delivery is quick. Order THREDKOTE 701 from your nearest Humble bulk plant in Texas, New Mexico and Arizona. Other areas contact Humble Oil & Refining Company, Houston, Texas.

HUMBLE

HUMBLE OIL & REFINING COMPANY



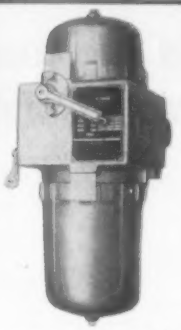
COMBINATION STARTERS IN Explosion-Proof ENCLOSURES

Here's Allen-Bradley's Bulletin 713 combination starter with circuit breaker—featuring conveniently removable explosion-proof cover and base—for use in hazardous gas and dust locations. Inside you'll find the time-tested A-B Bulletin 709 solenoid starter.

The consistent reliability of Allen-Bradley solenoid starters is a result of their design simplicity. With only ONE moving part, there's virtually nothing to go wrong—this is your assurance of millions of trouble free operations. In addition, the double break, silver alloy contacts are *always* in perfect operating condition—and remain so with *no* service attention. Also, all A-B starters have two permanently accurate thermal relays that protect motors against dangerous overloads. The reliability of these relays is not affected by atmospheric conditions or the length of time in service.

To insure maximum production with minimum maintenance, insist on Allen-Bradley *quality* motor control. Please write for full information.

Cutaway of Enclosure
Shows Allen-Bradley combination starter. Cover and base unscrew to permit quick access to the starter or the circuit breaker.



A-B Bulletin 713 Combination Starter

NEMA 4 Watertight Weatherproof

NEMA 7 Hazardous Gas Locations

NEMA 8 Corrosive Hazardous Gas

NEMA 9 Hazardous Dust Locations

These enclosures remain available. Because of the trouble free operation of Allen-Bradley control, bolted covers are not a problem.

Allen-Bradley Co., 1304 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

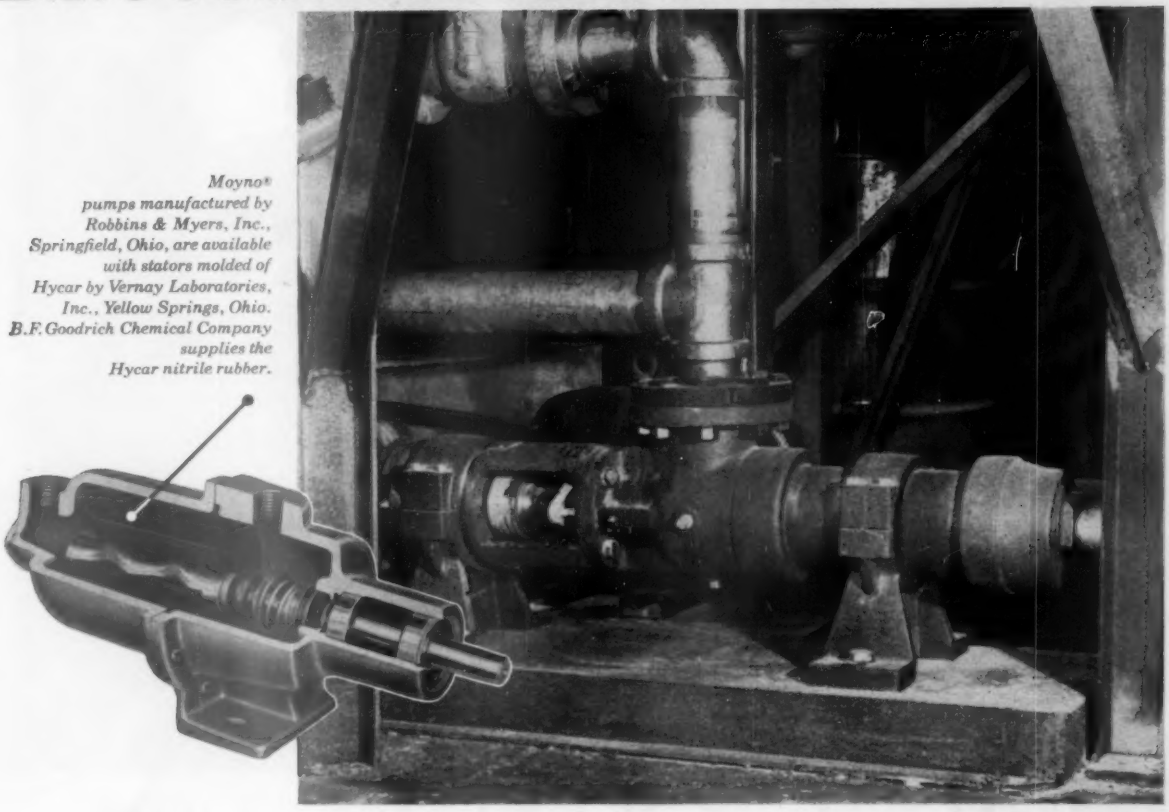
ALLEN-BRADLEY
Member of NEMA

Quality Motor Control

Another new development using

B.F.Goodrich Chemical *raw materials*

Moyno® pumps manufactured by Robbins & Myers, Inc., Springfield, Ohio, are available with stators molded of Hycar by Vernay Laboratories, Inc., Yellow Springs, Ohio. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.



STATORS OF HYCAR RUBBER

help pumps handle corrosive jobs

The manufacturer of these pumps says they handle "anything that flows through piping." When the going gets unusually corrosive or abrasive, stators made of Hycar nitrile rubber are used.

The Hycar stators are made in varying hardnesses—rigid for handling some materials, flexible for others. Any corrosive or abrasive material may call for Hycar stators; this pump manufacturer particularly recommends it for petroleum solvents and oils, vegetable oils, alcohols, all salt solutions, mild acids and corrosive liquids.

Hycar gives long-term service in an application like this because of its resistance to chemicals and corrosion that would destroy ordinary rubber. Hycar can be accurately molded into the complex double internal helical design of this pump's stator.

Here's another example of the way that Hycar nitrile rubber helps products find new applications, or helps develop new products. For information, write Dept. FH-11, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar

Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

25 YEARS OF SUCCESSFUL SERVICE
1935 GENERAL GEOPHYSICAL CO. 1960

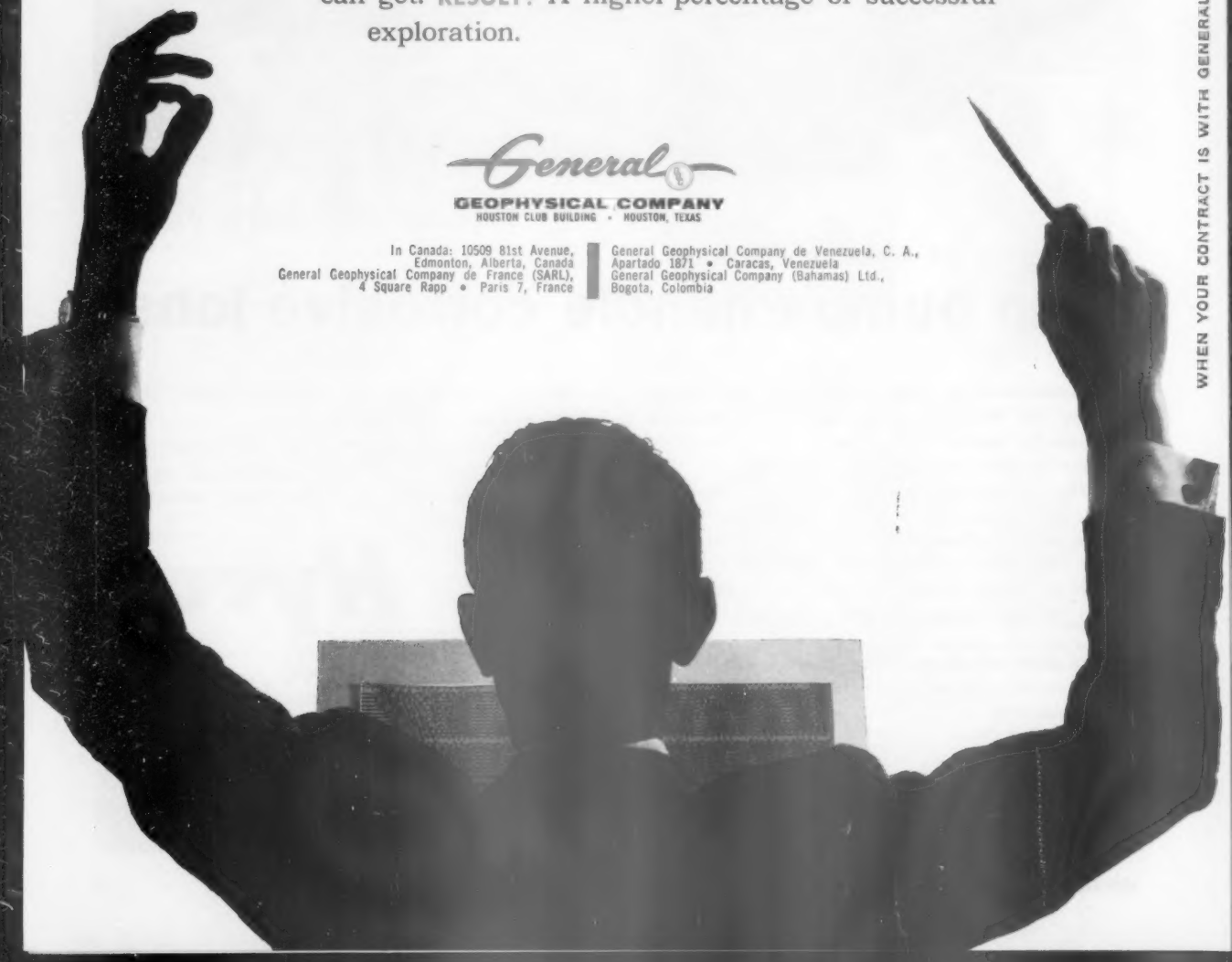
WHEN YOUR CONTRACT IS WITH GENERAL

The improved geophysical equipment and techniques resulting from General's progressive research and development program are employed on your prospect – wherever it may be – to obtain the best field results you can get. RESULT? A higher percentage of successful exploration.

General
GEOPHYSICAL COMPANY
HOUSTON CLUB BUILDING • HOUSTON, TEXAS

In Canada: 10509 81st Avenue, Edmonton, Alberta, Canada
General Geophysical Company de France (SARL), 4 Square Rapp • Paris 7, France

General Geophysical Company de Venezuela, C. A., Apartado 1871 • Caracas, Venezuela
General Geophysical Company (Bahamas) Ltd., Bogota, Colombia



WHEN YOUR CONTRACT IS WITH GENERAL, THE PERCENTAGE FOR SUCCESSFUL EXPLORATION IS IN YOUR FAVOR

"Still on schedule. No mud problem."

Whether it is a mud engineer's report or a driller's log, in case after case Baroid's new concept of mud marketing gives you better results. You may save in total drilling time, avoid a costly fishing job, or make substantial savings on mud material costs. In any case, you profit because Baroid has integrated and streamlined every step in the mud process, from original source to your drilling rig.

Simplified operating procedures are the order of the day in the oil industry. When an oil industry supplier, such as Baroid, controls all its services from mines, plants, laboratories, field engineering, well logging, stores and accounting, increased efficiency and savings result for you. Only through this method can product quality and complete service be maintained at the highest level in a competitive market.

Wherever you drill, Baroid has mud stocks nearby. Delivery is fast and accurate. You can secure all needed mud materials from a single source. Baroid's third of a century in the mud business gives you the greatest depth of experience and breadth of service. Baroid's unified operation helps you keep rigs on schedule and operating costs at a minimum.

You save drilling dollars with a Baroid mud program!

BAROID

BAROID DIVISION NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

6047

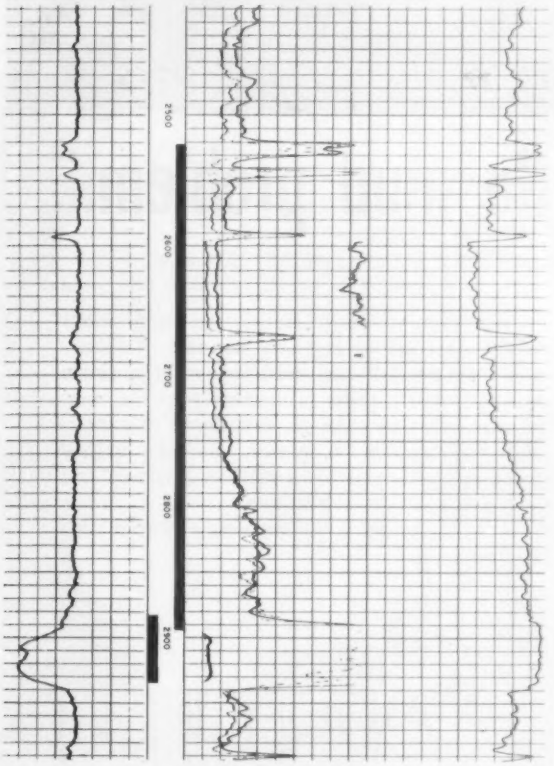
Here's How One Operator Solved Two Completion Problems and Saved Rig Time Too!

A rank wildcat, Stribling #1, was spudded in White County, Arkansas by Ambassador Oil Corporation with T.D. projected around 4500 ft. When the well was bottomed at 4511 ft., logs were run as the first step in evaluating formations and their producing potentials. A study of these revealed two interesting zones well up the hole. The logs indicated questionable permeability in sands above 3000 ft. and showed good departure of the resistivity curves.

Mr. A. J. Howell, Division Geologist for Ambassador, was faced with the problem of whether to set casing or not. A decision was made to run a Drill Stem Test. This, however, could mean serious trouble and add to the problems already encountered.

The area is notorious for subsurface conditions which vary from extremely hard sands to sloughing and swelling shales. Because of these conditions, fishing jobs are not uncommon.

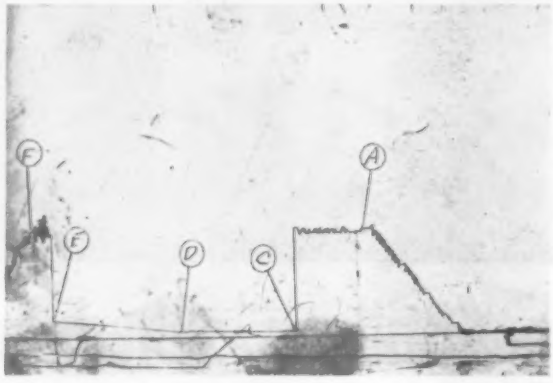
Trouble had already been encountered in getting logging tools in and out of the hole. To be absolutely safe, the operator wanted to test the formations without running a long tail pipe which might become stuck and require an expensive fishing job.

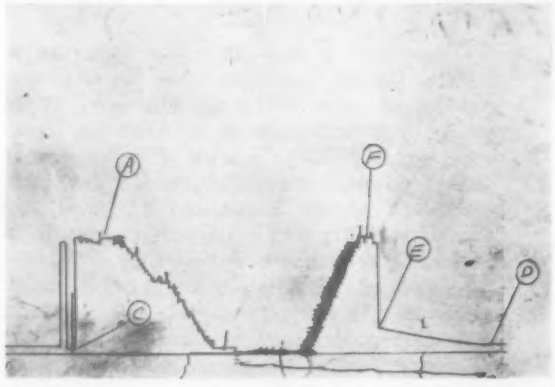


Johnston Testers solved two problems while testing the interesting formations. First, long tail pipe was not run during the tests because the new Johnston Selective Zone Anchor was used. Secondly, both zones were successfully tested. From the information gathered, it was decided that the formations definitely were not commercial producers and casing was not set needlessly in the well.

We quote from a letter written by Mr. Howell, "I would like to commend you for the excellent performance of both personnel and equipment in Drill Stem Testing our # 1 Stribling well in White County, Arkansas. Your Open Hole Selective Zone Tester worked perfectly in two Drill Stem Tests run at the well. From start to finish, both tests were run in less than 14 hours total rig time."

Because of the speed at which these tests were run, considerable rig time was saved, thereby reducing the overall costs.

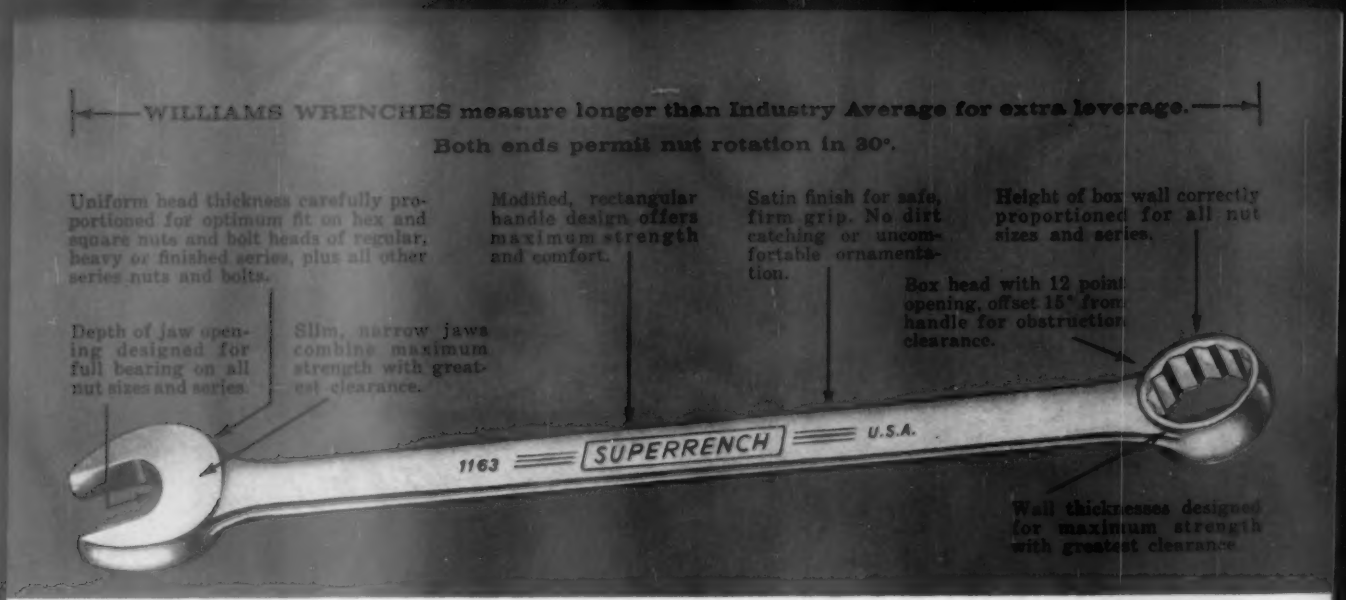




Testing problems such as these are solved by Johnston every day. When you have a question about any zone... when you want formation information . . . call Johnston Testers!

JOHNSTON TESTERS

Houston, Texas Calgary, Canada


WILLIAMS WRENCHES measure longer than Industry Average for extra leverage.
Both ends permit nut rotation in 30°.
Uniform head thickness carefully proportioned for optimum fit on hex and square nuts and bolt heads of regular, heavy or finished series, plus all other series nuts and bolts.
Modified, rectangular handle design offers maximum strength and comfort.
Satin finish for safe, firm grip. No dirt catching or uncomfortable ornamentation.
Height of box wall correctly proportioned for all nut sizes and series.
Box head with 12 point opening, offset 15° from handle for obstruction clearance.
Depth of jaw opening designed for full bearing on all nut sizes and series.
Slim, narrow jaws combine maximum strength with greatest clearance.
1163
SUPERRENCH
U.S.A.
Wall thicknesses designed for maximum strength with greatest clearance

You need both... QUALITY DESIGN QUALITY MANUFACTURE

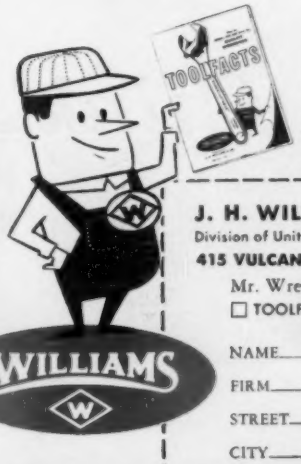
IT'S A PUSH BUTTON WORLD AT WILLIAMS
This three station transfer machine drills, broaches and chamfers box openings to close Williams' tolerances.

Open-end heads are broached to extremely close tolerances on this two station vertical ram machine.

You get the most for your money when you buy WILLIAMS!

You get the most for your money when you buy any tool, wrench or stock forging from Williams' broad line of 4530 stock catalog items.

THE BROADEST LINE OF ITS KIND



MR. WRENCH SAYS: "Get the Facts ... get TOOLFACTS ... new 24 page booklet on how to select, use and care for Quality Wrenches."

J. H. WILLIAMS & CO.
Division of United-Greenfield Corporation
415 VULCAN STREET, BUFFALO 7, N. Y.

Mr. Wrench: Please send me your new
☐ TOOLFACTS Booklet ☐ ILLUSTRATED CATALOG No. 304

NAME_____ TITLE_____
FIRM_____
STREET_____
CITY_____ ZONE_____ STATE_____

Heralding

McClintock of FIRST

MAC . . . Man-At-Arms for OILMEN!

As president of Zephyr Drilling for 8 years and an officer of the company nearly 20, Mac McClintock, our Executive V.P., learned the oil business from the "bottom hole" up. And as a director of First National for 11 years, he has combined his knowledge of oil and banking in a significant contribution to the stature and experience of our Oil Department. All this means better oil banking for you when you . . .

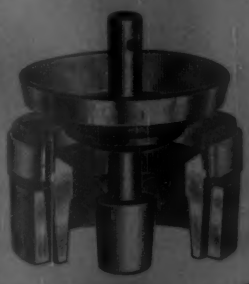
Think . . . 1st of Tulsa SINCE 1895

FIRST NATIONAL BANK AND TRUST COMPANY

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

GET THE MOST

Mission SUPER-SERVICE®



Mission MUD MONARCH®

Mission SILVER TOP®

ONE OF THESE MISSION VALVES AND SEATS WILL GIVE YOU THE MOST FOR YOUR MONEY

Because Mission Valves and Seats are designed to give you the most for your particular service. For *extremely high pressures*, the Mud Monarch® with an effective seal ring even when body and seats are severely worn. Compound 308® and Compound 711 inserts are available. For *medium pump pressures*, the Mission Super Service, with four cross arms for extra strength. And for *low and medium pressures*, the Silver Top with replaceable, wear-taking bushing which greatly reduces valve seat replacement. Compound 308 inserts are interchangeable with Super Service valves. Longer life is built in to all Mission valves and seats to give the most with all popular makes of reciprocating pumps. At supply stores everywhere.

MISSION MANUFACTURING CO.

MISSION MANUFACTURING CO., *P. O. Box 4209, Houston, Texas cable address* "MISSCO" • *export office: 30 Rockefeller Plaza, New York*

In The United Kingdom: MISSION MANUFACTURING CO., LTD., *17 Hanover Square, London W. 1 England* • *cable address* "MISSOMAN"

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Ethylene Glycol Scores High As Hydrate Inhibitor

In refrigeration-type gasoline recovery plants, the most widely used hydrate point depressant is diethylene glycol. But, ethylene glycol may offer certain advantages as a replacement in your plant, for example . . .

SELECTION GUIDE

ADVANTAGE	Ethylene Glycol	Diethylene Glycol
Hydrate Inhibition	GOOD	GOOD
Ease of Separation	BETTER	GOOD
Cost	LOWER	—
Vaporization Loss	LOW	LOWER
Solubility Loss	LOWER	LOW

HYDRATE INHIBITION

While both ethylene and diethylene glycol give good hydrate inhibition, with hydrate point depressions generally in the range of 60° to 80°F., reports indicate that ethylene glycol may give a greater depression in those cases needing very low separation temperatures.

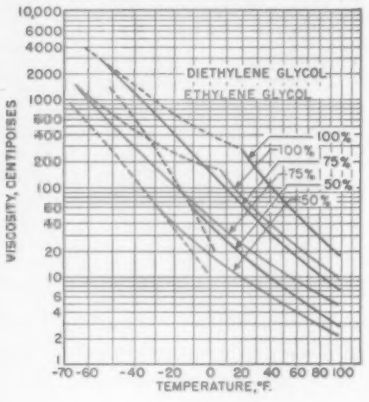
EASE OF SEPARATION

Ethylene glycol-water solutions are easier to separate at very low temperatures than diethylene glycol-water solutions.

This advantage is illustrated in the graph below. At 0°F. the viscosity of a 50 per cent ethylene glycol solution is 20 centipoises, or half the viscosity of the diethylene glycol solution.

An even more marked difference is shown at lower temperatures . . . at—40°C. a 75 per cent ethylene glycol solution has a 300 centipoises viscosity, as compared with 1000 to 2000 for a 75 per cent diethylene glycol solution.

VISCOSITY OF GLYCOL-WATER MIXTURES



COST

Ethylene glycol costs 1¾¢ a pound less than diethylene glycol which means a possible tank car savings of $1,300.

VAPORIZATION

Although ethylene glycol vaporization losses are greater than diethylene glycol's, the difference is insignificant below 30°F., if separator pressure is 750 PSI or higher.

SOLUBILITY

At separation temperatures of 60°F., glycol losses due to solubility should be in the range of 10 to 50 ppm when 50 to 75 per cent ethylene glycol solutions are used; and 20 to 100 ppm with equal strength diethylene glycol.

The higher volatility of ethylene glycol must be taken into consideration in regeneration equipment design and operation; but ethylene glycol may offer advantages in certain systems. Your CARBIDE Technical Representative can show you data on the pros and cons of ethylene or diethylene glycol hydrate inhibition in your system.

For a copy of a new report, "The Glycols as Hydrate Point Depressants in Natural Gas Systems" and a comprehensive bibliography of all the major articles published on gas sweetening and dehydration in the last 25 years, use the coupon.

UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY, Division of Union Carbide Corp., 270 Park Ave., N. Y. 17, N. Y.

Please Send Me

- ☐ Technical data report—"The Glycols as Hydrate Point Depressants in Natural Gas Systems."
- ☐ 24-page Gas Sweetening Bibliography.
- ☐ Please have a CARBIDE Technical Representative call.

NAME:..... POSITION:.....

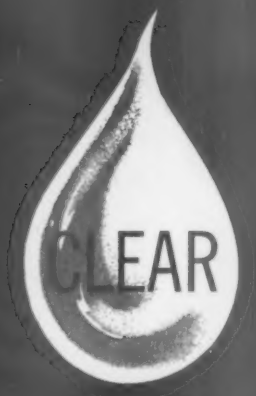
COMPANY:.....

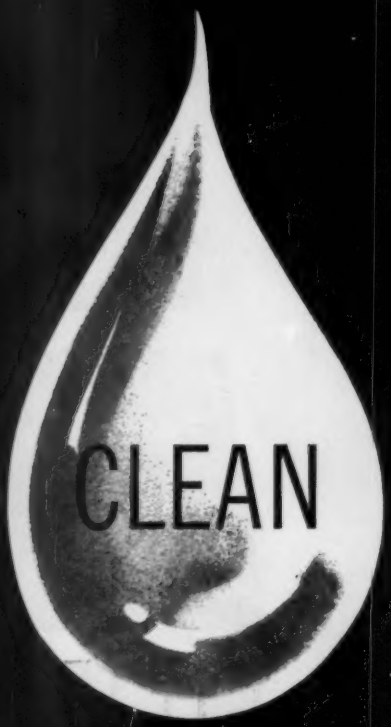
ADDRESS:.....

CITY:..... STATE:.....

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE





WATER

PRESSURE MAINTENANCE INJECTION, WATERFLOOD, SURFACE, SUBSURFACE, & OFF-SHORE DISPOSAL REQUIRE CLEAR, CLEAN WATER

The problem is to treat effluent or produced water so that it will be harmless to equipment, underground formations, and wildlife and watersheds—a problem made tougher by the fact that no two water treating problems are alike.

Flexibility and adaptability of BS&B's extensive line of Aqua-Kleener units enable you to match up a variety of solutions with the variety of water treating problems encountered, from an installation composed of a single filter and storage tank to complete open and closed systems.

THE BS&B AQUA-KLEENER LINE:

Treaters, Oil Skimmers, Free Water Knockout Tanks, Backwash Tanks, Filters, Filta Wash Tanks, Phanto-Matic Backwash Controllers (for automatic filtering), Aerator/Degasifiers, Raw Water Treating Tanks, Bolted Steel, Welded Steel, Wood or Poxyglas Storage Tanks.

Ask your local representative for full information or write to BS&B, Dept. 1-A11 P. O. Box 1714, Oklahoma City, Okla.

BS&B

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • EDMONTON • THE HAGUE
LONDON • PARIS

CYANAMID BRINGS YOU A NEW
HYDROGEN TREATING CATALYST

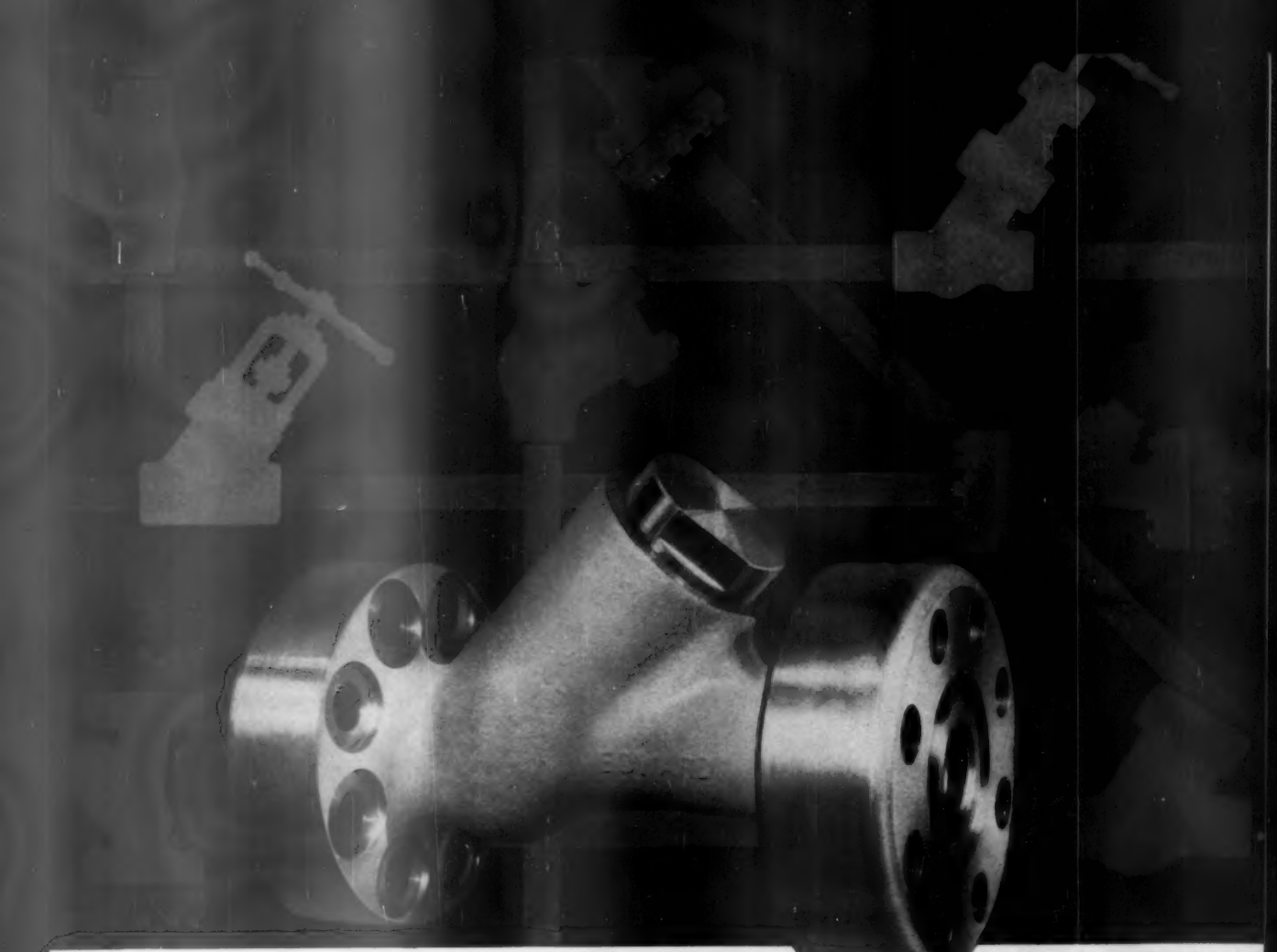
AERO® HDS-3

Now you can have the benefit of desulfurization with markedly increased nitrogen and polyaromatics removal over cobalt-molybdenum catalyst compositions. Particularly well adapted for giving improved color to waxes, treatment of nitrogen-containing naphthas, or hydrogenation of cat cracker feedstocks and middle distillates. AERO HDS-3 is a new addition to Cyanamid's line of catalysts. Write for further information.

BASIC IN CATALYST CHEMISTRY.

CYANAMID

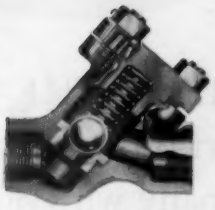
AMERICAN CYANAMID COMPANY • REFINERY CHEMICALS DEPARTMENT • 30 Rockefeller Plaza, New York 20, N. Y.



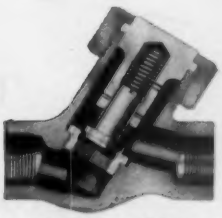
High Pressure Check Valve
Fig. 9160 10,000 lb WOG
Horizontal or Vertical

Edward Check Valves give positive protection against flow reversal

Edward forged steel check valves are built for the rugged duty required in oilfield and refinery piping systems. This complete line of Rockwell-built valves is available in ball or piston type; screwed, flanged, or socket welding ends; union, screwed, bolted, or welded covers for pressures to 10,000 psi, temperatures to 1050F. Field tested interior design assures long life, positive seating with minimum pressure drop. Check valves are available up to 2″ in forged steel. Cast steel piston check valves and tilting disk check valves up to 18″. For details, contact your favorite oilfield supply store or write to Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. 6020



Ball Check Valve
Fig. 4632, Bolted Bonnet
Rating: 600 lb at 900F
(2000 lb WOG)
Horizontal or Vertical



Piston Check Valve
Fig. 3578, Union Bonnet
Rating: 1500 lb at 850F
(3600 lb WOG)
Horizontal or Vertical

Edward Ball Check Valves are recommended for liquid services, especially where heavy, viscous fluids are encountered. Stainless steel ball disk is fully guided and closure is aided by stainless steel springs. Edward Piston Check Valves feature EValloy* 13% chromium stainless steel seat and disk, and Ironkote soft metal gasket for leakproof body-bonnet joint. Stainless steel spring assures positive seating.

*T.M. Reg. U.S. Pat. Off.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

THIS IS THE BEST WAY TO LOAD TANKERS-
And the heart of this system is the swivel joint. Produced by a company with 30 years of experience in solving flexible line problems. Proven by hundreds of installations around the world on Chiksan's Hydraulic Marine Loading Systems and other dockside loading lines. Recommended and preferred for safety and long life by responsible men everywhere. It is a **CHIKSAN** Swivel Joint.

fmc

CHIKSAN COMPANY—General Offices: Brea, California • Well Equipment Mfg. Corp. Division (Weco Unions, Hamer Valves) • Chiksan International • Chiksan of Canada Ltd.
Offices and Representatives in Principal Cities of the World

Where communications really count...oilmen rely on Collins 32RS-1 single sideband transceivers

Today's oil frontiers are often just that . . . outposts tied together only by radio communications. Where communications are the lifeline . . . your men need the dependability of Collins SSB.

Because single sideband transceivers use only half the normal AM channel width, leakage and interference from adjacent channels are eliminated, and effective output is about 400% greater than in conventional AM transmission. And, with the carrier eliminated, single sideband is virtually immune to distortion from selective fading.

Collins 32RS-1 SSB transceivers are easily operated by non-technical personnel. What's more, with Collins Mechanical Filters, the signal comes in loud and clear. Either VOX or push-to-talk actuation of the transmitter may be used; accessory phone patch and TTY units are available.

Interested? To learn more about single sideband . . . and Collins frequency stability, distortion reduction and low spurious product, write Collins for full particulars on the 32RS-1 transceiver.

COLLINS

COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA • DALLAS, TEXAS • BURBANK, CALIFORNIA

FROM ROTARY RIG...

Neoprene Can Cut Your Costs. In the field, where every minute counts, downtime is costly. That's why you'll so often find neoprene on the job. Neoprene's unique *combination* of properties is particularly well suited for rough drilling rig conditions.

For example, neoprene is both oil and abrasion resistant . . . stays tough and resilient in any kind of weather—for years on end. And neoprene gives you an extra bonus of safety: flame resistance.

Specify neoprene the next time you buy your rotary hose, pipeline scraper cups and other oil field rubber products. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department OG-11, Wilmington 98, Delaware.

DU PONT NEOPRENE

REG. U. S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

TO PIPELINE PIG

MAXITEST®

. . . the Ashcroft Gauge that gives you accuracy to 1/10 of 1% for testing other pressure instruments

Here is a unique master reference gauge of the most precise accuracy and easy readability. It is possible to calibrate to 1/10 of 1% accuracy, making it the finest test gauge you can use in maintenance work, field inspections, and in the laboratory. It is particularly useful in checking accuracy and calibration of test gauges, receiver gauges, transmitters, and other pressure-operated devices to 10,000 psi.

No Parallax Effect with Maxitest

The Maxitest has a durable lightweight Alumalife® case with convenient carrying handle. It is also available without handle and back connected for flush mounting. It has an 8½" Maxivision® dial—a two-level dial with needle-sharp pointer on the same plane as the tab graduations to eliminate parallax errors. Case and dial are painted contrasting "eye-rest" greens to assure surest, sharpest readability indoors and outdoors, without eye strain.

Metal Tabs Replace Dial Graduations

Adjustable metal tabs completely replace the usual printed major dial graduations. The standard number of graduation tabs supplied is determined by the psi scale range of the particular model desired. They are positioned near the outer circumference of the dial but can be precisely set individually to assure exact pressure reading at each point. (Up to 1/10 of 1%—the calibration standard of a deadweight gauge tester.)

Each tab is "hairline" marked to indicate any accuracy deviation—from ¼ of 1% to 1% of total dial graduation. A blank dial is available to permit the user to set the tabs as preferred.

Available in Pressure, Vacuum, and Compound Types—Total graduations range from 0/15 psi to 0/10,000 in pressure types with tab intervals appropriately assigned. 0/30" vacuum type has tabs at 2" intervals. Compound types have graduations 15 psi and 30" vacuum with tab intervals at 3 psi and 5"; 30 psi and 30" vacuum with tab intervals at 5 psi and 10". For testing receiver gauges, the Maxitest can be supplied with dial ranges of 3/15, 3/27 and 6/54 psi.

SEND FOR CATALOG

For complete information about the Maxitest or the complete line of Ashcroft test gauges and gauge testers, phone your industrial supply distributor—or mail the coupon for Catalog 300B.

MANNING MAXWELL & MOORE INC. TRADE MARK

ASHCROFT PRESSURE GAUGES

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Manning, Maxwell & Moore, Inc.
East Main Street
Stratford, Connecticut

Send me complete information about the Ashcroft Maxitest and other test gauges, gauge testers, and service gauges.

Name_____

Title_____

Company_____

Address_____

City/Zone_____ State_____

CHOOSE FROM A COMPLETE LINE . . . Another reason why you get more value with Guiberson . . .

Sure, there's a difference!

Dress your swab with genuine Guiberson cups and see for yourself.

You wouldn't wear a tux in a ball game, or overalls at a formal dance — and, for successful swabbing, it's more important that your swab be correctly dressed to suit the conditions. Guiberson, and only Guiberson, offers a selection from nine types of cups and suitable swabs in sizes ranging from 1" through 13⅜".

In most tubing swab jobs, one of three types of well-proved, service-certified Guiberson cups will give superb performance.

Type J

Flexible, strongly reinforced for repeated runs under heavy loads in deep wells.

Type L

More flexible, for medium or heavy loads in wells of any depth.

Type GW

Even more flexible, for light to medium loads in shallow wells, stripping light loads in wells of any depth, and for use in rough or deformed pipe.

Swabbing in oil, water, or acid-water, these cups last and last and lift fluid at a rate that assures a profitable operation. It stands to reason that, with the many variables possible in swabbing, no single type of cup or swab can give maximum performance under all conditions. If you have a special problem, your Guiberson representative will gladly recommend the combination of cups and swab best suited for your particular situation. Supporting his selection is the experience and integrity of the first and foremost swab manufacturer in the world.

Sold by Oil Field Supply Stores Everywhere

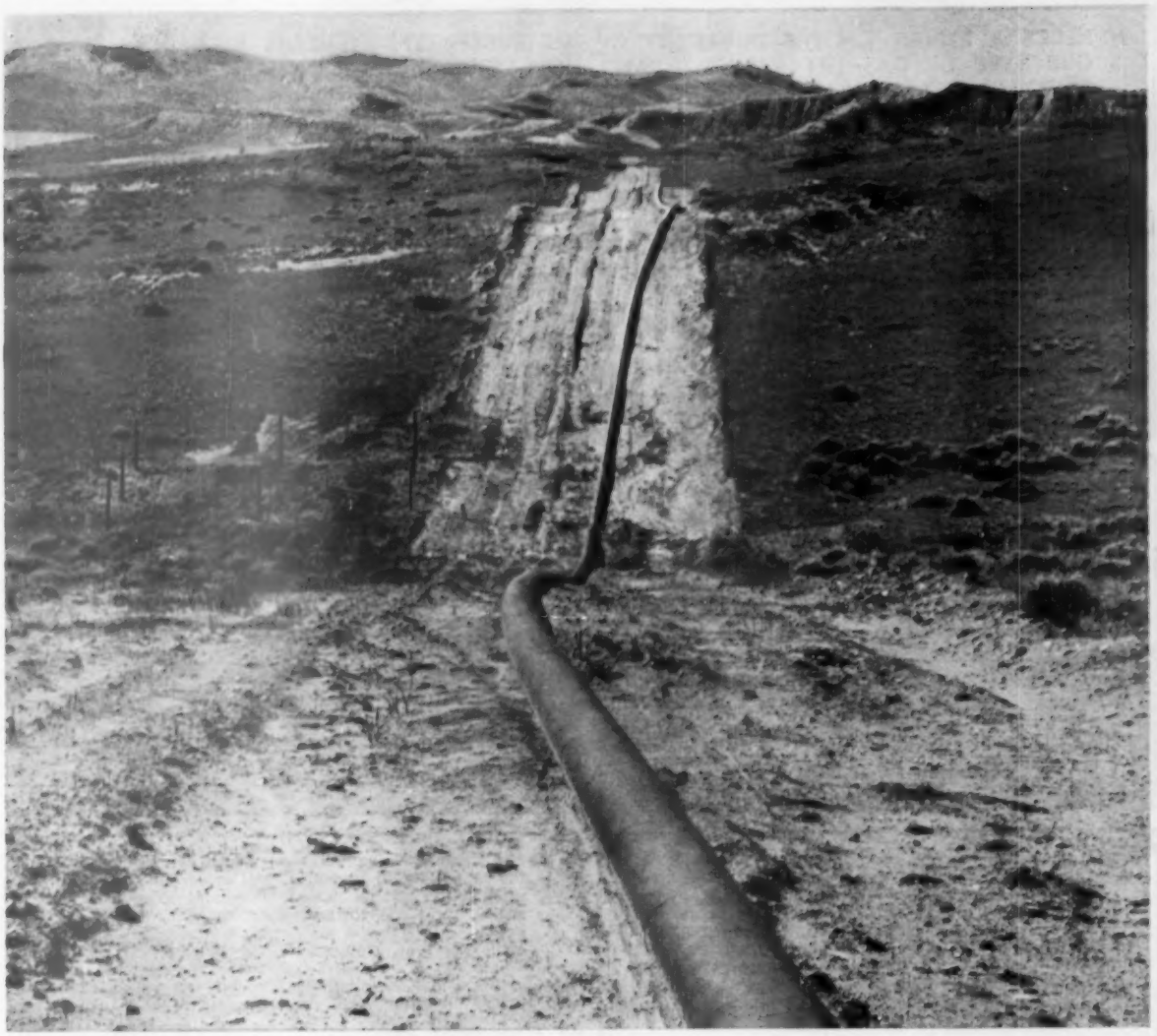
THE GUIBERSON CORPORATION
DALLAS, TEXAS, U. S. A.

SAFE THAN SORRY GUIBERSON NEVER BE

DRESSER INDUSTRIES INC.

PRODUCTION, DRILLING AND WORKOVER SPECIALTIES, MOLDED RUBBER PRODUCTS

OIL • GAS • ELECTRONICS
CHEMICAL • INDUSTRIAL



Armco Line Pipe Combines Strength and Economy

New steels are born at Armco

Low residual stresses in line pipe mean more strength to handle unforeseen or accidental overloads. Tests show that the maximum residual stress in Armco Pipe is about 90 per cent less than in many commonly used standard pipes.

It's thrifty to specify Armco Line Pipe, too. You don't pay for "extra" steel—132 different diameter-wall thickness combinations let you meet your requirements *exactly*.

Write us for complete information on Armco Line Pipe. Armco Drainage & Metal Products, Inc., 5010 Curtis Street, Middletown, Ohio.

ARMCO DRAINAGE & METAL PRODUCTS

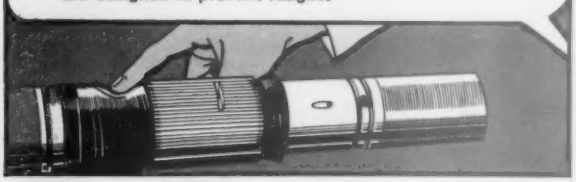
Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company • The Armco International Corporation • Union Wire Rope Corporation

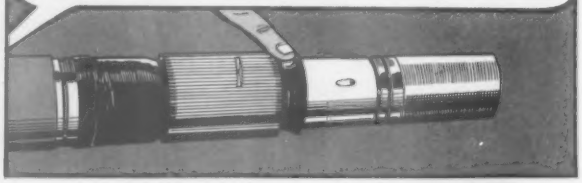
HERE'S A REPORT ON THE DURABILITY OF THE RUBBER-TYPE ELEMENTS USED IN OUR TYPE OF GAS LIFT VALVES — AND HOW THE DESIGN PRINCIPLE SAVED A SOUTH TEXAS WELL OWNER THE COST OF A CONVERSION WORKOVER.

The valves covered by this report have been in the well for 5 years now—and have given perfect service. What's more, they saved the operator the cost of a workover just three months following installation, when the well had to be converted from continuous to intermittent lift. The well has been produced intermittently since that time and the well owner is pleased with the operation of the valves.

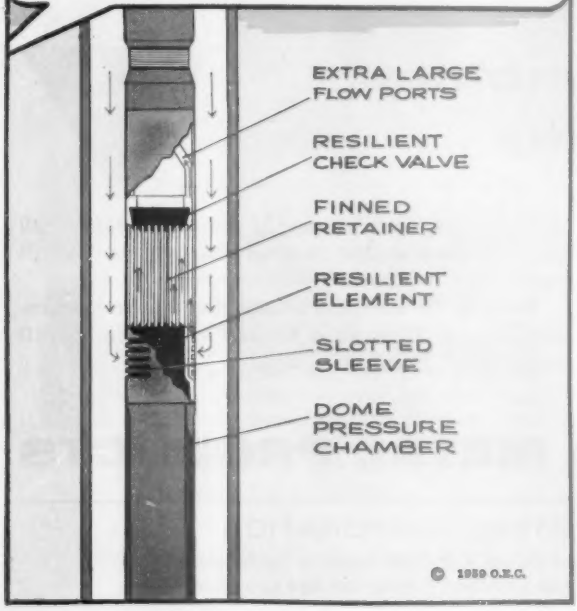
Here, let me show you the many advantages of the resilient elements in our valves. First, because this main element is resilient, it resists erosion from the system gas. Second, the flow area across the element is the largest flow area of the valve, which not only helps to reduce any cutting action from the system gas but minimizes the movement required to admit gas from the annulus during operation. These features are designed to prevent fatigue.



The same principles apply to the check valve here. It compresses just slightly as gas passes over it, then —when necessary to check back pressure from the tubing—it acts to form a bubble-tight seal against the finned retainer and inside wall of the valve. And the rubber-to-metal seal principle of both resilient elements eliminates the excessive wear normally associated with metal-to-metal, stem-and-seat type valves.

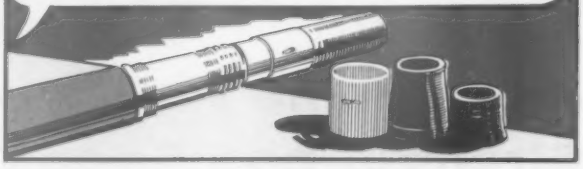


I'll show you how we bond the main valve element to the valve mandrel assembly in a minute—but first let me show you this flow diagram of our Type C Gas Lift Valve. Pressure from the valve dome holds the main valve element closed across the slotted ports. When gas pressure in the annulus exceeds the set pressure of the valve, the main valve element opens. When the pressure from the annulus drops below the set pressure of the valve, the valve closes.



© 1959 O.E.C.

Now here's how we bond the main valve element to the valve mandrel assembly. First we serrate the sealing surfaces of the mandrel assembly to give it a superior bonding surface. Then we apply a special bonding cement, slip the rubber element into place, and bake the complete assembly for one hour at 375° F. This produces a pressure-tight seal at the element end of the dome chamber. As a result, our valves can be expected to maintain their set pressure indefinitely.



If you're planning a new gas lift installation and want to RUN VALVES THAT WILL STAY IN THE HOLE and give you trouble-free service — INSTALL OTIS GAS LIFT VALVES. They have no moving metal parts . . . no bellows to fatigue . . . no metal seats to cut out . . . and they're designed to operate continuously or intermittently without having to be pulled for conversion. Contact one of our gas lift specialists at the Otis office nearest you. He'll be glad to show you these and other exclusive features and explain how Otis Gas Lift Valves are designed to save you money.

Otis - "First in Gas Lift Control"

OTIS

OTIS ENGINEERING CORPORATION

General Offices: 6812 Denton Drive Dallas

Branches Throughout the Oil Country

Memo to Management:

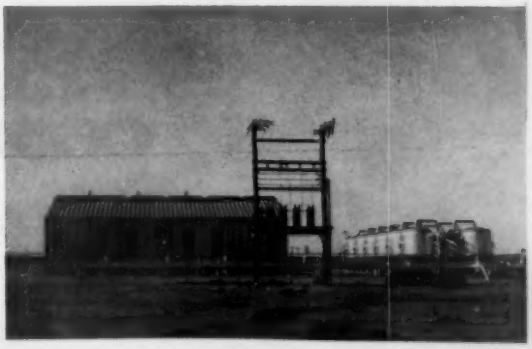
. . . YOU GET THESE SAVINGS AUTOMATICALLY with Utility Electric Power

Utility electric power is highly efficient in modern automatic operations and brings with it worthwhile savings in money, manpower and time. Furthermore utility electric power is adaptable, flexible . . . providing high-continuity of service around the clock, when and where you need it. Call your utility electric power company for details.

PETROLEUM POWER ELECTRIC ASSOCIATION

BOX 35006, DALLAS 35, TEXAS

A list of P.E.P.A. members will be furnished on request.



Survival of the Fittest

A month in the woods with only a bare survival kit separates the men from the boys, with a vengeance. Darwin's law of the survival of the fittest still pertains today in connection with certain segments of the oil industry. And this matter of survival in the oil business is a deadly serious one, not separating the men from the boys, but the quick from the dead.

What can be described casually as a "technical readjustment" by someone in a newsletter is an entirely different matter to the man whose bread and butter are at stake. Many supply stores, for example, are looking for a survival kit of their own, after taking a long, hard look at the age of their receivables. What to do with receivables 90 and 120 days old requires as much skill and know-how as living a comparable time in the woods with only a pocket knife.

Unfortunately there's no magic wand, no miraculous rescue by helicopter. The best help you can get is from a man who knows your business, knows the oil business, and understands credit and the management of money. You'll find men like these in the Oil and Gas Department of The National Bank of Commerce of Houston. You'll find that if anyone can help you they can. But, remember, they work no miracles; so come before it's too late to help.

THE NATIONAL BANK OF COMMERCE
OF HOUSTON

MAIN, TRAVIS, AND CAPITOL

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

A BASIC SEGMENT OF A BASIC INDUSTRY

* **The Supply Industry**, when considered as being composed only of those firms which conduct their affairs in the sensible and ethical manner you desire in your own field of competition, is a well managed industry.

Like the **Petroleum Industry,** it is actively adjusting to the less favorable economic conditions which presently exist. It can do this and continue to serve you adequately if it is not forced to collapse under pressures, however unintentional, which are urging it along the path to self-destruction.

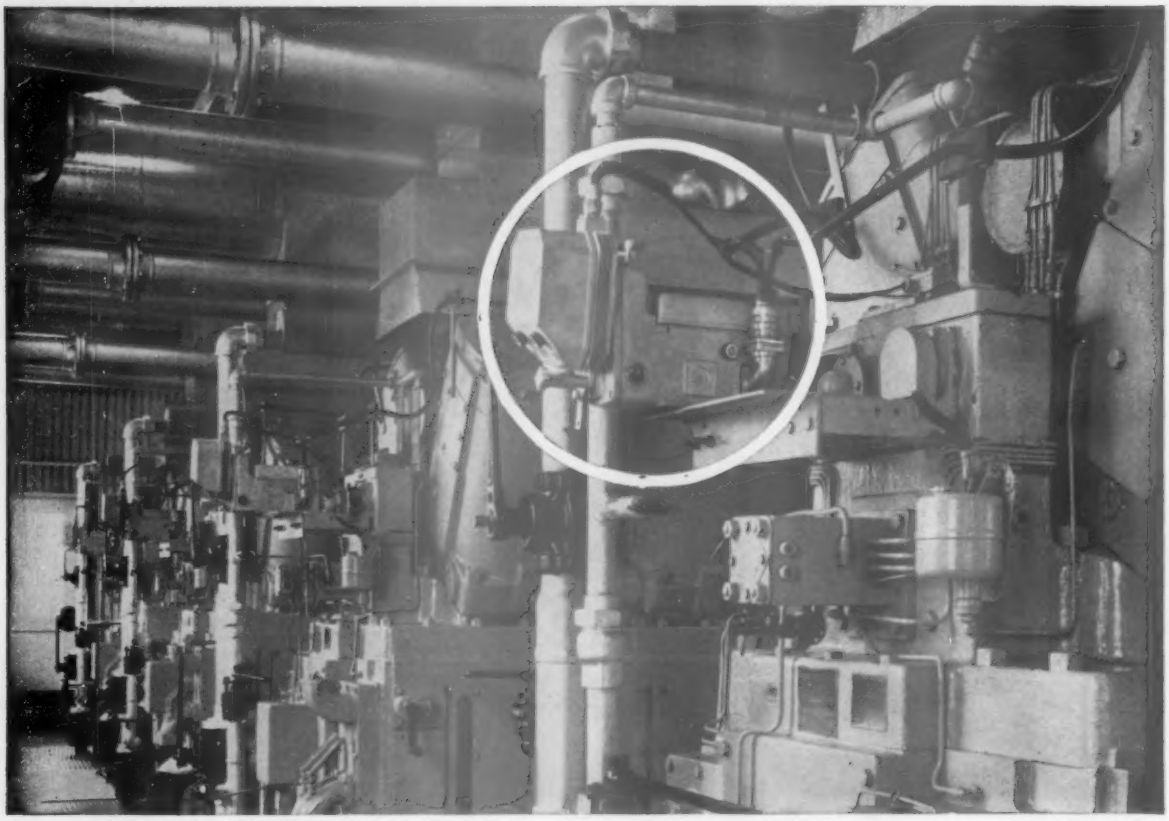
There will be no winners if the ever-present economic gadflys take over and this basic segment of one of our Country's basic industries shrivels to insignificance or vanishes.

The Supply Industry is a solid part of your own economy. Its problems deserve your thoughtful consideration. It has always earned your support.

LARKIN PACKER COMPANY
DIVISION KOEHRING COMPANY
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

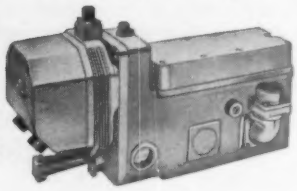
LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE



BENDIX DLC IGNITION

designed specifically for natural gas and petroleum industries

Hi-V Coil



DLC Magneto

A MATCHED IGNITION SYSTEM

1. Long service life
2. Simplified maintenance
3. Longer spark plug life
4. No unscheduled ignition shutdowns
5. Positive spark timing
6. High voltage output
7. Matched ignition system
8. Single or dual ignition
9. Flameproof
10. Low maintenance costs
11. For engines of 6 through 16 cylinders

At the installation shown here, DLC Ignition unfalteringly performs its function in aiding with the preparation of natural gas for consumer use.

Bendix* DLC Ignition is the result of the most modern engineering design, and incorporates the latest developments in ignition materials. That's why it meets the most exacting requirements of modern high-compression engines used by the natural gas and petroleum industries.

Because DLC Magneto and Hi-V Transformer Coils form a matched ignition system, it delivers ample voltage while, at the same time, assuring reduced maintenance costs.

If you want facts on why important operators specify Bendix DLC Ignition, write: SCINTILLA DIVISION, THE BENDIX CORPORATION, SIDNEY, NEW YORK. *REG. U.S. PAT. OFF.

Export Sales and Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y. *Canadian Affiliate:* Aviation Electric Ltd., 200 Laurentien Blvd., Montreal 9, Quebec. *Factory Branch Offices:* Burbank, Calif.; Orlando, Florida; Chicago, Ill.; Teaneck, New Jersey; Dallas, Texas; Seattle, Washington; Washington, D. C.

Scintilla Division
SIDNEY, N. Y.

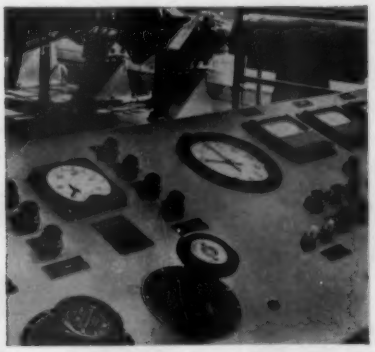
THE Bendix CORPORATION

Lufkin reduces friction, cuts maintenance with Timken® bearings on pumping unit crank pins

Since oil field production equipment must run unattended for years on end, Lufkin Foundry & Machine Company engineers specified Timken® tapered roller bearings for the crankshaft and clutch of this engine and for the crank pins of the pumping unit. By using Timken bearings they eliminated shaft wear, crankshaft adjustment and minimized the oil seal problem.

Because Timken bearings hold shafts concentric with their housings, they make closures more effective—keep dirt out, lubricant in. Their tapered design enables them to take both radial and thrust loads in any combination. And because they're made of the finest bearing quality alloy steel available, they can stand up to the continuous, pounding, cyclic shock load of this equipment.

ON-THE-SPOT engineering service helps manufacturers solve bearing problems before they arise. Timken bearing sales engineers are experienced graduate engineers—the pros of the bearing business.



RESEARCH AND DEVELOPMENT, typified by the huge dynamometer above, help keep Timken bearings your No. 1 bearing value. The data it provides helps increase performance of Timken bearings.

Industry rolls on

TIMKEN®

tapered roller bearings

The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO." *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.* Canadian Division: Canadian Timken, St. Thomas, Ont.

fast, high pressure hot taps

MUELLER®
CH-6 drilling machine

Make fast automatic cuts under pressures up to 1440 p.s.i. with the Mueller CH-6 Drilling Machine.

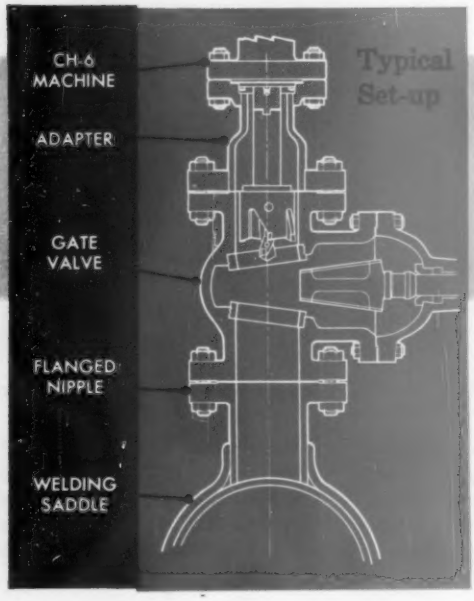
High pressure lateral connections may be quickly completed to any line or tank by using the CH-6 Machine and a high pressure gate valve. Simply weld a hat flange or drilling nipple to the line or tank, bolt the gate valve to it, and bolt the CH-6 Machine to the valve.

The CH-6 Machine may be operated by hand or by an air motor or gasoline engine power unit without changing the machine. Automatic power cutting does not require supervision during the cutting operation.

The adaptability of the CH-6 Machine makes a great variety of nipple and valve combinations possible.

Write for complete information.

CH-6 Machine with air motor power unit making hot tap through high pressure steel gate valve.



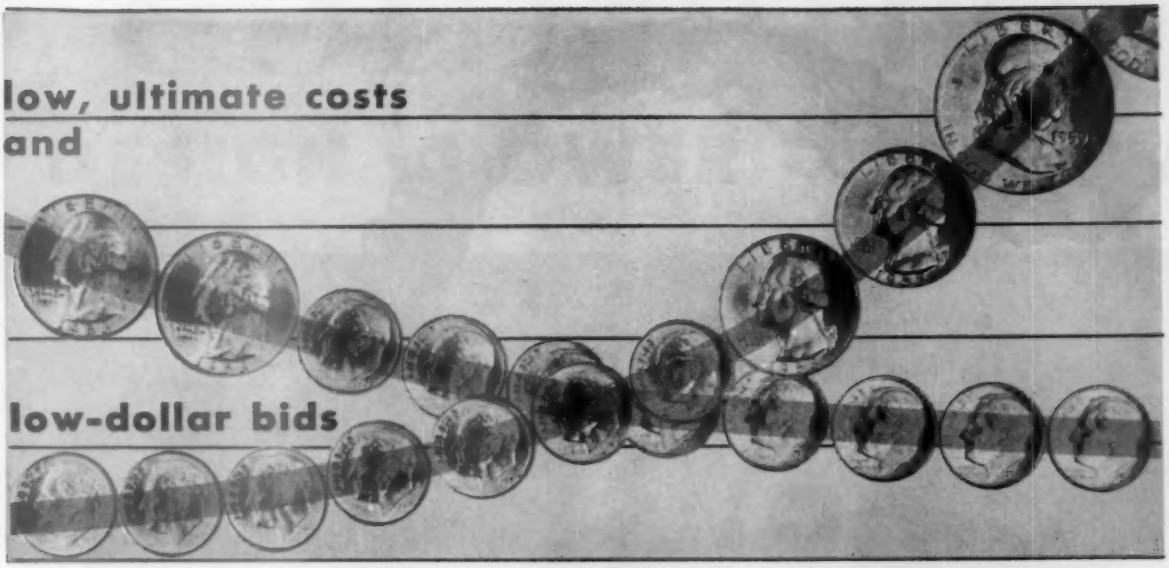
SPECIFICATIONS

- Cuts from 2" through 6".
- 1440 p.s.i. maximum working pressure at 100° F.
- 500° F. maximum temperature rating at 1250 p.s.i.
- Adapters available for use with valves having 150, 300, 400 and 600 pound flanges.

NO-BLO®

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario



are not the same

The historic struggle between long-range economy and "low-dollar" first-cost is brought into extremely sharp focus in the competitive bidding for heat transfer equipment sales in the process industry . . . especially where *continuous flow* processes are involved.

Recognition of *all* factors contributing to the economy of such continuous, uninterrupted operations has become the cornerstone of Western's appraisals and solutions. It is further reflected throughout the design, mechanical, thermal and rating phases of the engineering of each Western Heat Exchanger.

Western engineers understand this "fact of life": we must, to the best of our ability, anticipate the *continuing expense* of operation and maintenance of heat exchangers, so that such ultimate costs are kept at a minimum, and our exchangers *operate at a profit* for our customer. Otherwise, it is false economy indeed, regardless of the "initial cost."

Western Heat Exchangers are quoted for *long-range economy*, not short-sighted "low-dollars" . . . and a visit with a Western engineer will show you how and why.

WESTERN'S STAKE IN YOUR FUTURE

In today's "business arena" it is increasingly important for process engineers to take the *full* look at *true economy* in the production of chemical and petro-chemical products. Pointing to the need for such understanding is the next of Western's "professional-advancement" messages, shown at right, currently seen in leading petroleum and chemical trade journals . . . and available in more complete detail in pamphlet form, upon your request.

One of a series appearing in OIL & GAS JOURNAL, CHEMICAL ENGINEERING, PETROLEUM REFINER, REFINING ENGINEER, CHEMICAL ENGINEERING PROGRESS.

serving the growth of the process industry

WESTERN

HEAT EXCHANGERS

WESTERN SUPPLY COMPANY

P.O. Box 1888 – Tulsa, Oklahoma

"LOW FIRST-COST vs. LOW ULTIMATE COST" controversy demands understanding of economics involved

When is a "low bid" really low? This perplexing question consistently faces the engineer charged with the responsibility of ordering capital process equipment with a wary eye towards the profitability of such equipment in his company's long-range economy, yet, beset with the necessity for tightly-budgeted current operations.

Another
of the invisible extras that
insure MORE ON-BOTTOM TIME
with LINK-BELT FR®
roller chain

Optical comparator inspection guarantees

precision of every part

Precision is *rigidly practiced* in every step of Link-Belt's roller chain production. The optical comparator is an example of the specialized equipment used to assure precise manufacturing control of chain parts and tools. It is capable of magnification up to 100 times.

Continuous inspection is just one of the *invisible extras* that insure more on-bottom time with Link-Belt roller chain. Others include precise heat-treat control, prestressing, shot-peening, Fatigue Resistant FR* processing of sidebars.

U. S. Patent No. 2,517,497

NATIONAL'S T-32 RIG incorporates Link-Belt FR roller chain.

Features like these are the reasons why users agree Link-Belt roller chain has greater capacity to withstand the smashing impacts and tortuous stresses met in day-to-day drilling.

For engineering assistance in applying FR roller chain, write Link-Belt Company, Indianapolis 6, Indiana. Ask any leading supply store for our Catalog 2980 containing full information on roller chain and other oil field equipment.

15,552

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22, (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

LINK-BELT

ROLLER CHAINS AND SPROCKETS

compare

• DESIGN • POWER • STAMINA

BUY A... SIOUX **ELECTRIC DRILL**

CERTIFIED SIOUX POWER

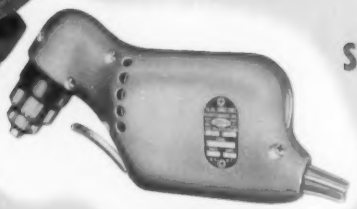
Electric Drills

When it's a SIOUX– you know what it will do!

The horsepower and torque for each SIOUX electric drill is rated, stated, and certified. You are not expected to buy just a drill. When it's a SIOUX you know what it will do. See complete power specifications for each SIOUX Electric Drill in the SIOUX catalog.

Super Powered 1/4" & 3/8" DRILLS!

Here is super torque for the toughest jobs. And a speed for every need. Entirely new design has placed the brushes at the fan position at the front of the drill. Advantages include easier inspection and replacement without disassembly of the tool, and cooler running. Catalog No.'s 1472,73,74 —1/4"; No.'s 1477,78,79—3/8".



SALES CHAMP

SIOUX No. 1495 1/4" All Angle Drill

This exclusive SIOUX design is a favorite of men who work with tools. It's the most convenient, rugged, fistful of power. It operates in restricted space where other drills can't be used. All around usefulness on the widest range of jobs make this sturdy, dependable No. 1495 one of the world's best drill buys.

SIOUX

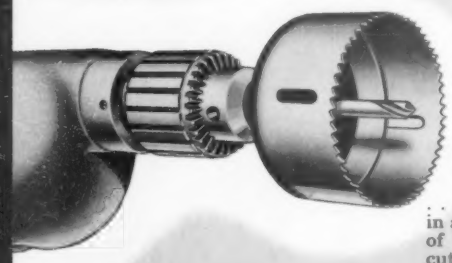
ELECTRIC SCREWDRIVERS

No. 260

On No. 260 Super Screwdriver, the operator controls the tightness with which a screw is set by the amount of pressure he applies. The 1/4" Hex Drive takes shanks for clutch head screwdriver bits, Reed and Prince, Standard screws, Phillips, and socket (Allen Type). On the No. 262 Super Screwdriver tightness is pre-determined by adjusting the clutch. Both models are equipped with reversing switch.

No. 242

It fits the hand, and operates in restricted space like no other electric screwdriver. It quickly drives or removes all types of screws. No. 242 has a positive clutch; the operator controls the tightness by the amount of pressure applied. No. 246 has an adjustable clutch, so that it can be preset for any uniform degree of tightness desired.



SIOUX *High Speed* STEEL HOLE SAWS

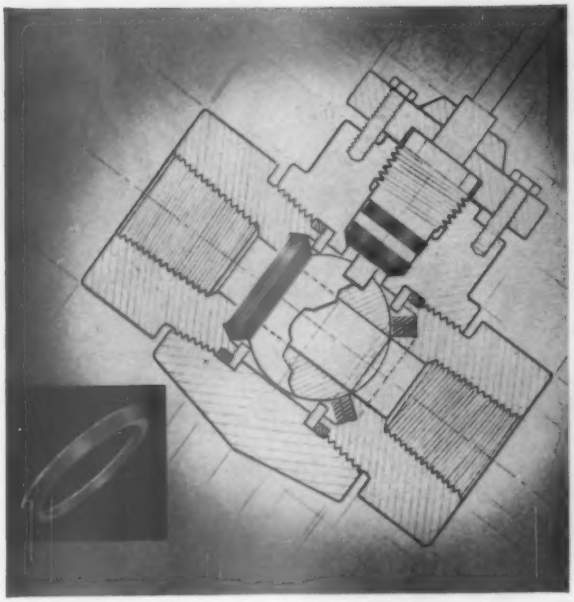
. . . cut holes from 5/8" to 6" in diameter, in any free machining material to a depth of 1 1/8". Alloy or stainless steel may be cut at slow speed. High-Speed steel teeth welded to chrome-vanadium body give maximum life and cutting ability.

Look Under **"TOOLS, ELECTRIC"** *in the Yellow Pages*

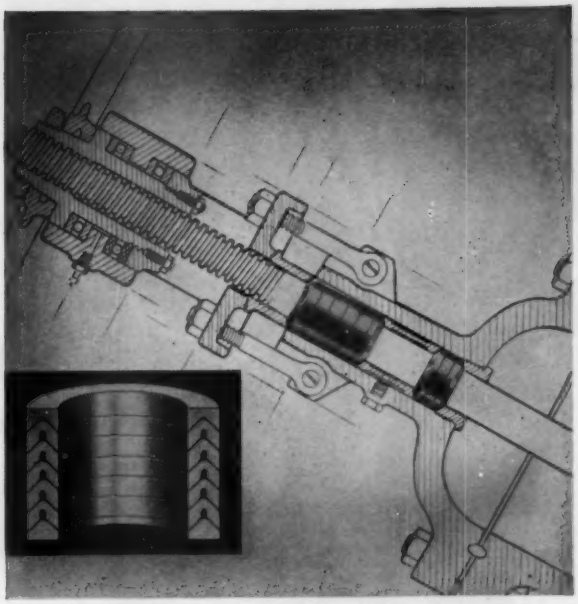
ALBERTSON & CO., INC.

SIOUX CITY, IOWA, U. S. A.

• AIR IMPACT WRENCHES • AIR SCREWDRIVERS
• ELECTRIC IMPACT WRENCHES • ELECTRIC SCREWDRIVERS
• DRILLS • GRINDERS • SANDERS • POLISHERS • FLEXIBLE SHAFTS • PORTABLE SAWS • VALVE GRINDING MACHINES • ABRASIVE DISCS.



Seats and stem gaskets of TFE resin assure tight-sealing, no-stick operation in these non-lubricated ball valves used in high-pressure butane-propane service. These valves have been in operation for three and one-half years, with no leakage or valve failure.



V-ring packings of a TEFLON TFE resin in valves for paper-mill service eliminate the frequent changes of packing and periodic adjustments formerly required. In addition, losses of corrosive liquor are eliminated and wear on valve stems is sharply reduced.

Maintenance and replacement costs reduced with packings and gaskets of TEFLON® TFE resins

The two examples above typify the cost-cutting advantages of TEFLON fluorocarbon resins as packing and gasket materials. In all applications TEFLON resins provide long service life . . . with resultant savings in maintenance and replacement costs, plus increased productive capacity due to less downtime. TEFLON resins are not affected by materials being processed. Their low-friction characteristics often permit their use without lubrication, minimize torque requirements, and reduce wear on pistons and shafts.

TFE resins are the established standards where reliability over a wide range of severe conditions is important. They are rated for continuous service at 500°F. FEP resin is the new melt-processible member of the family of TEFLON fluorocarbon resins. It can be molded and extruded like nylon, polyethylene and other familiar resins. FEP resin is capable of continuous service at 400°F.

In many applications, TEFLON fluorocarbon resins have been found to be the only material that would give satisfactory performance. But even when service demands are not exceptionally rugged, the properties and versatility of TEFLON TFE and FEP resins permit plant-wide standardization for packings and gaskets in petrochemical service.

For more information about the wide variety of forms in which TFE and FEP resins are available for sealing applications, consult your supplier. And for additional information about properties and characteristics of TEFLON resins and the many ways they have led to improved, economical designs, write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department T-30117, Room 2526, Nemours Building, Wilmington 98, Delaware.

• • •

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

DU PONT REG. U.S. PAT. OFF.

TEFLON®

FLUOROCARBON RESINS

TEFLON is Du Pont's registered trademark for its family of fluorocarbon resins, including TFE (tetrafluoroethylene) resins and FEP (fluorinated ethylene propylene) resin.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

QUICK RETRIEVING OF A FISH CAN BE ACCOMPLISHED

MAJOR FISHING JOBS CAN BE PREVENTED

WHEN YOU KEEP A

BOWEN RELEASING AND CIRCULATING OVERSHOT

AVAILABLE

A high percentage of fishing jobs are the result of twist-offs. Immediate recovery action can PREVENT a troublesome, time-consuming, expensive fishing job.

The longer a fish remains in the hole, the greater the fishing problem becomes and the more difficult and costly it is to retrieve. Restore Circulation — Recover The Fish Fast — Prevent High Expense with a BOWEN RELEASING AND CIRCULATING OVERSHOT!

Bowen Overshots are compact, durable and powerful, and are capable of withstanding extreme pulling and jarring strains without damage to the tool or fish.

Bowen Overshots can be dressed to recover many different sizes of fish, to mill over, catch and pack off. They are available in a complete range of sizes for tubing and drill strings.

Send for complete technical literature!

For over 25 years—the world's leading manufacturer of fishing and specialty tools.

BOWEN ITCO, INC.
P. O. Box 4587
Houston 13, Texas, U.S.A.
Cable Address: ITCO

BOWEN

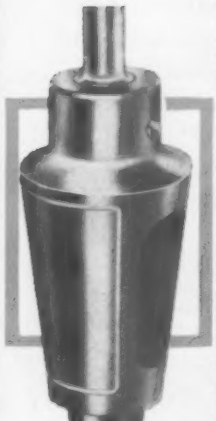
NO LEAKAGE...

You're looking at the newest thing in valves . . .

STOCKHAM'S NEW WEDGEPLUG* "O-SEAL" VALVE

Two Teflon** "O" rings in the plug give constant vapor-tight shut-off . . . to give you double assurance of double savings on operating and maintenance costs.

NO LUBRICATION...



HOW TEFLON "O" RINGS WORK The two Teflon "O" rings are inserted in dovetail grooves machined on the face of the plug. These "O" rings seat on the raised body seats when the plug is in closed position.

CONSTANT VAPOR-TIGHT SHUT-OFF This sealing effect of the "O" rings gives absolute shut-off in all cases—shut-off that remains permanently "bubble tight." The Teflon "O" rings are chemically inert, practically frictionless, and will not cold flow.

TESTS PROVE POSITIVE SHUT-OFF

Hundreds of tests of this new valve in all types of services have failed to make it leak. Performance has been remarkable. In every case, the valve held "bubble tight" because of the pressure seal effect of the "O" rings.

OTHER OUTSTANDING ADVANTAGES

Non-Lubricated—no costly maintenance necessary • Provides Double-Block and Bleed in most services • Quick, Easy Operation—won't stick or bind • Double Seating for Double Safety—Ground metal-to-metal seat provides shut-off in case fire burns out "O" rings • No Product Contamination • Protected Seats

RECOMMENDED USAGES Stockham's new "O-Seal" is recommended for all general purposes—air, gas, water, steam, propane, hydrocarbons, etc., as well as for hard-to-hold services. Recommended for temperatures from minus 300°F to 400°F and not exceeding 720 psi.

Available in carbon and alloy steels, 2" - 12" sizes, 150 and 300 lb. pressures. Three port openings—40%, 70%, full round-wrench, handwheel, gear, and motor operated.

*Patented
**Teflon DuPont Trademark

STOCKHAM'S NEW WEDGEPLUG "O-SEAL" VALVE

Call Your STOCKHAM Distributor or Sales Representative for complete details, or write today for the new brochure on the Wedgeplug "O-Seal."

Stockham makes a **BETTER** *valve...for* **EVERY** *job!*

WEDGEPLUG VALVE COMPANY Division of →

STOCKHAM VALVES *and* **FITTINGS**

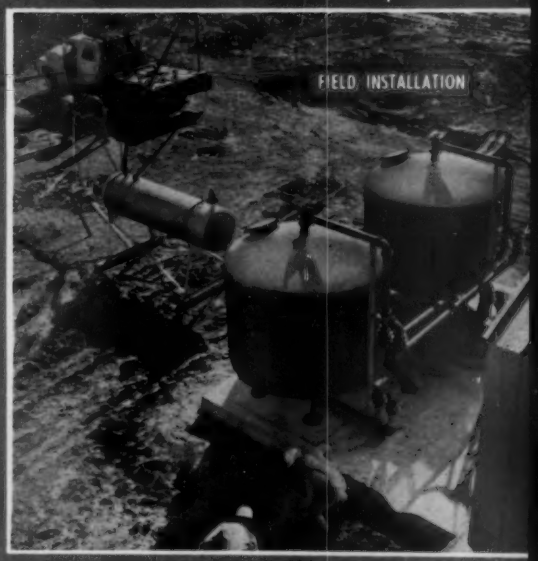
General Offices and Plant—4002 North 16th Avenue, Birmingham 2, Alabama

CAST IRON-MALLEABLE PIPE FITTINGS • BRONZE, CAST IRON, DUCTILE IRON, CAST AND FORGED STEEL VALVES

MID-CONTINENT SUPPLY CO.

SUPERMARKET for SERVICES, TOO!

Mid-Continent "Supermarkets" have everything . . . including thousands of supply and equipment items plus SERVICES, too. Our supply service in the field includes handling orders or instructions through a two-way radio network from mobile to field store or office to quickly supply your requirements. Factory-trained personnel stand ready 24 hours a day to assure machinery field service . . . making repairs on location if possible. Field installation, an important sales service, is provided by qualified personnel for complete projects. Supplementing the sales organization, Mid-Continent's engineering staff offers technical assistance and designs equipment for your exact needs. And, for international customers, multi-lingual personnel are an important part of our organization. These are SUPERMARKET SERVICES! Your needs are quickly and economically supplied at the sign of the familiar neon derrick on your Mid-Continent "Supermarket" . . . a symbol of sure service around the world.



SM5-0

MID-CONTINENT SUPPLY CO.

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Mid-Continent Building, Fort Worth, Texas • Export Division: 45 Rockefeller Plaza, New York 20, N.Y. Cable: MIDCUMPORT NYK

3 REASONS WHY

EVERY REFINER SHOULD USE...

There are three important and different reasons—and ways—for refiners to use copper deactivator. One or the other applies to every refinery.

COPPER-FREE GASOLINES easily pick up copper in treating, from condensers, valves, lines or contaminated blending stock —or even during transfer of gasoline in bulk or service stations.

NORMAL GASOLINES usually show traces of copper, often enough to reduce or nullify the effect of antioxidants. Through the use of a small amount of AW(50) the amount of inhibitor may sometimes be reduced, at an overall reduction in additive cost!

DISTILLATE OIL BLENDS often form insoluble sediment and darken in color. Whether inhibitors are used or not, a small quantity of AW(50) added to fuel oils minimizes color and sediment deterioration.

UOP Copper Deactivator AW(50) remains liquid down to 0°F, is convenient to use, and is approved for military fuels including aviation gasoline. Write for samples.

UOP
COPPER
Deactivator
AW 50

*

See our PSE*

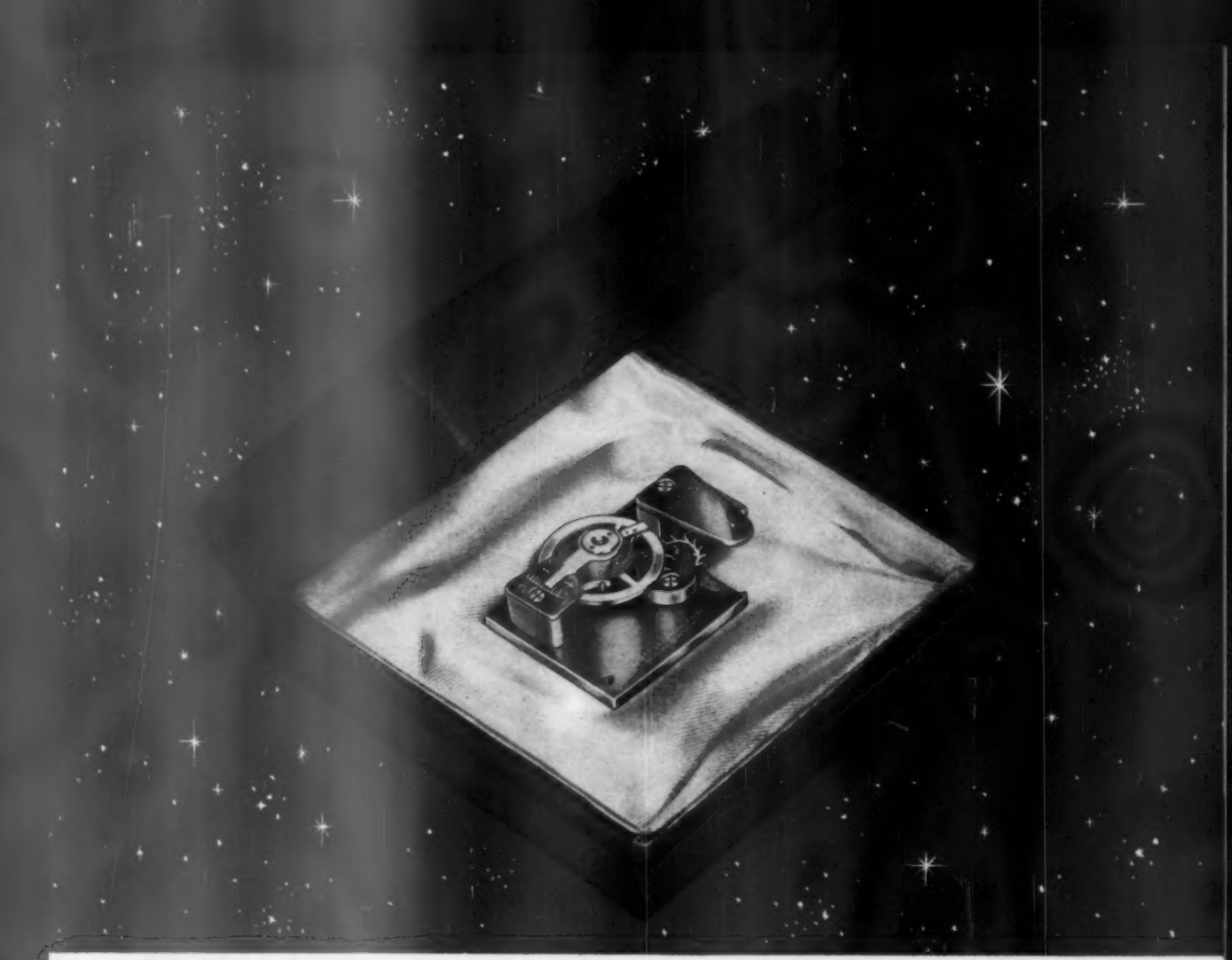
Correct selection and most effective use of petroleum inhibitors and additives involves expert analysis and consideration of many factors relating to your feedstock and methods of processing. As specialists for over a quarter-century, UOP is able to provide unparalleled field service, brought to you by a member of our staff of Product Sales Engineers. For detailed information on the UOP family of superior inhibitors and additives, call or write our Products Department.

UOP

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U.S.A.



This "jeweled" escapement brings you fine watch quality in chart drives

See how easy it is to convert to seven different rotation rates

The main arbor on the basic chart drive has a rotation rate of seven days. Economical snap on turrets convert this rate to 8 day, 15 day, 16 day, 24 day, 30 day, 31 day and 24 hour rotation. No tools are required and you can even change chart rotation without removing the drive from the instrument.

Now, for the first time you get the extra value of a jeweled movement. This superior construction makes Rockwell chart drives more accurate and sensitive than ordinary chart drives. It requires less power to drive and is extremely durable since there are seven hard jeweled surfaces to overcome friction and wear.

You can use these jeweled movement chart drives *with profit* to power all your recording instruments. They will adapt into practically any instrument case. Speed changing turrets (see left) permit varying rotation rates at will. Write for bulletin. Rockwell Manufacturing Company, Dept. 59L, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., P.O. Box 420, Guelph, Ontario.

JEWELED CHART DRIVES

another fine product by

ROCKWELL

with efficient, economical Davison Silica Gel

Hydrocarbon recovery from the dehydration of natural gas can pay your gas drying costs. The large pore volume of Davison Silica Gel attains recovery efficiencies up to 95%. For example, a unit operating on 30 to 120 minute cycles at 100° F. can recover up to three gallons of butane-plus per 100 lbs. of silica gel.

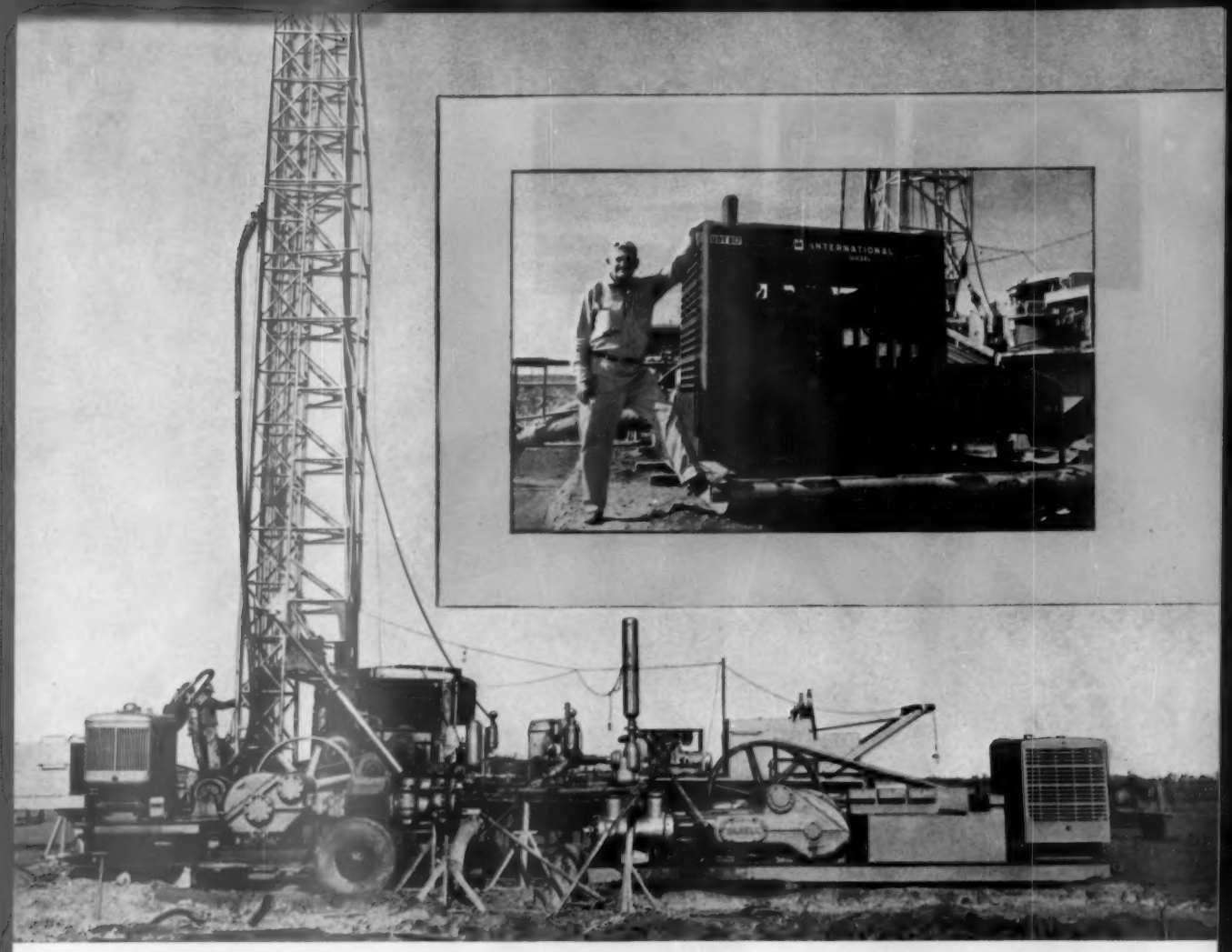
Specify Davison Silica Gel in your hydrocarbon recovery unit. Write Dept. 3111 for complete information.

Department 3111

W.R. GRACE & CO.

DAVISON CHEMICAL DIVISION

BALTIMORE 3, MARYLAND



35-year experience shows International *best oil field power!*

"I have worked the oil fields 35 years, and haven't found anything harder on men and equipment than just plain drilling. I like International engines for their toughness and ability to take rough use day after day and keep going. They can really take it!" —Andrew Dickens, Partner, Valley Oil Co.

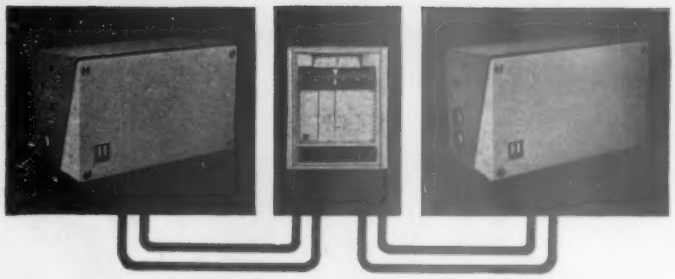
Ask an old pro if you want the lowdown on power efficiency in the oil fields. Andrew Dickens, Valley Oil Co., Cottula, Texas, has been in the business for 35 years, and he knows a lot about engines. Mr. Dickens backs up his preference for International with facts. The Valley spread shown above is powered by four IH engines—a new UDT-817 and a UD-525 on mud pumps, plus two older and still efficient IH diesels on drill and draw works.

Experience is important to an engine builder, too. It's no coincidence that International, the world's oldest and largest producer of heavy-duty engines, also produces the most efficient power for heavy-duty applications. Thousands of customer records, kept over the years, show that International engines work harder and last longer on the tough jobs!

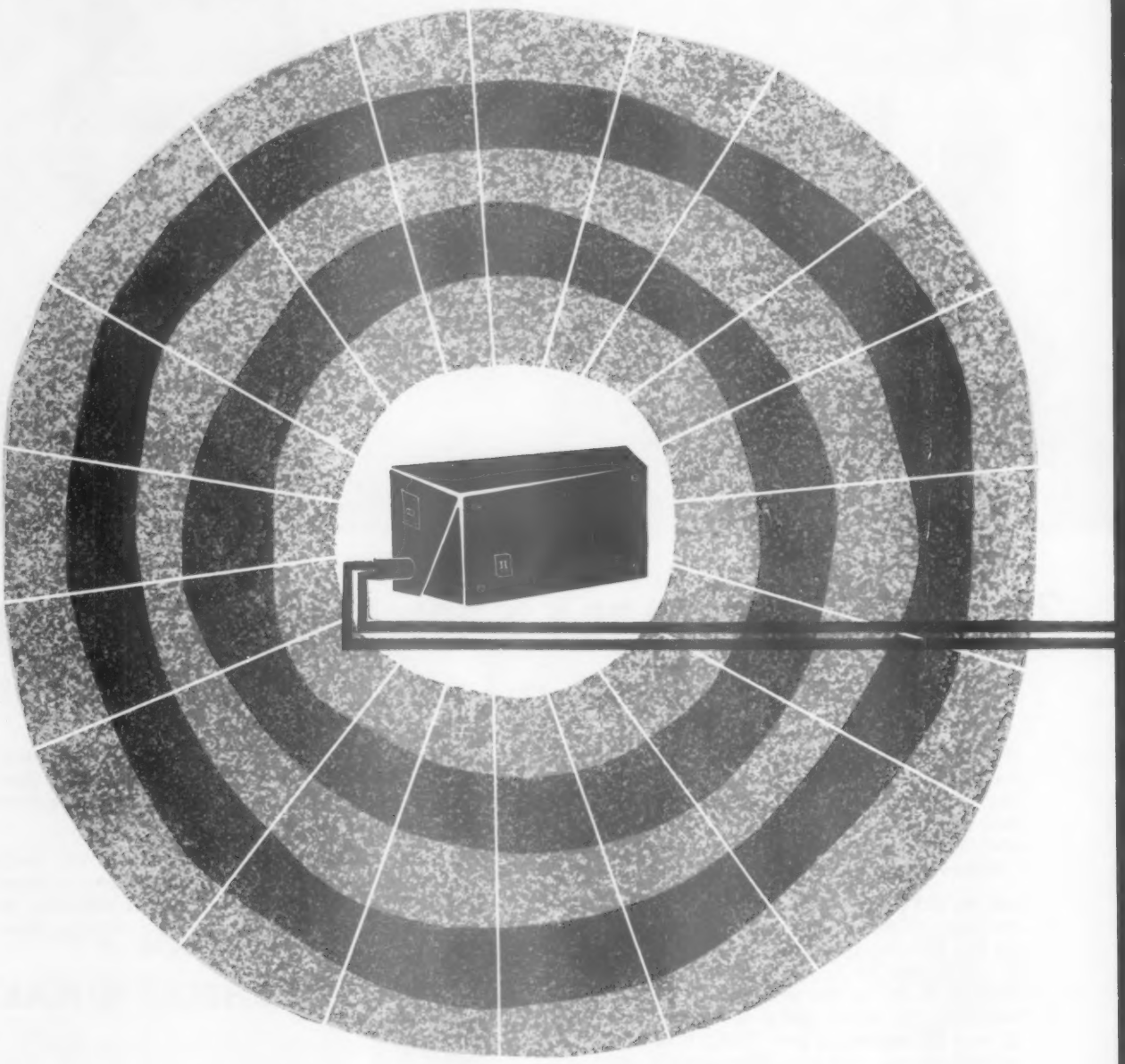
Your power requirements can be quickly and easily handled with a call to your nearby International Engine Dealer or Distributor. He has complete information on the 35 models—16.8 to 385 max. hp.—in the International line. Call him today!

INTERNATIONAL®
ENGINES

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE



***ElectriK Tel-O-Set*—the true 2-wire system**



TAKING THE HEAT OFF FIELD-MOUNTED TRANSMITTERS

The *ElectriK Tel-O-Set* System takes the heat off field-mounted instruments by *eliminating heat-generating tubes and power packs.* There's no external power required at any *Tel-O-Set* field-mounted instrument. The line power connection is made only at the receiver.

Tel-O-Set field-mounted instruments operate on a low calorie diet of 4-20 milliamps . . . less than 0.6 watts. A simple two-wire line connects the field-mounted instruments with the control room. The two wires carry the control signal as well as the power. The d-c transmission avoids stray pickup and phasing problems . . . eliminates the need for shielding the line.

The 4-20 milliamp signal range of the system gives a live zero and permits the use of the most reliable transistors available. These d-c signals can be fed into data handling systems and millivolt-actuated instruments . . . can be easily transduced to a standard 3-15 psi pneumatic signal to operate existing pneumatic systems.

The basic circuit used in *Tel-O-Set* transmitters, receivers, controllers and other instruments has been thoroughly proved in thousands of applications in the last five years. This circuit uses a force-balance feedback system to increase the accuracy and the dynamic response of the system by decreasing hysteresis effects and sensitivity to changes in ambient conditions.

Take a new look at your control applications with the *ElectriK Tel-O-Set* System in mind! Get complete technical data from your local Honeywell field engineer. Call him today . . . he's as near as your phone. MINNEAPOLIS-HONEYWELL, 21 Penn Street, Fall River, Mass.

Honeywell

First in Control

SINCE 1885

75th YEAR — ENGINEERING THE FUTURE

OIL KING!

Acknowledged so

by oil men who have used all kinds of gauges

The ten-gallon hat on the Marsh Mastergauge is worn as a crown of acceptance, an emblem of excellence... well earned through years of rugged oil country service.

Just as kings ascend thrones through lineage, the Mastergauge was destined for "royal" acclaim the day it hit the drafting board. Because every product born at Marsh is "born to the purple."

For what other gauge has the Marsh heritage of functional design innovations? Only Marsh offers Conoweld construction, the Marshalloy case, "coined" sector Mastergauge movement, "Recalibrator" adjustment, and optional Safecase protection plus.

That's why we say the *next* great thing that happens in gauges will happen at Marsh.

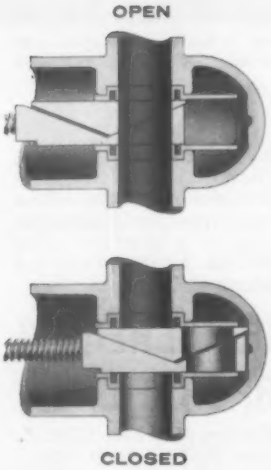
MARSH INSTRUMENT COMPANY, Dept. L, Skokie, Ill.
Division of Colorado Oil and Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas

MARSH GAUGES

In stock at your nearest Supply House

"THE STANDARD OF ACCURACY"

Get the extra margin of control in W-K-M Multiple Completion Valves



Available in no other integral multiples, the famous W-K-M Parallel Expanding Gate lets you control the *seating force* as well as the action of opening and closing.

This extra margin of control lets you close the valve to *absolute shut-off* . . . open it until the gate assembly is sealed positively against the seats for *perfect through-conduit* flow. Result: *no* turbulence to cause erosion or abrasion.

The extra protection of W-K-M Integral Multiples is the most economical production insurance you can buy.

Types: Duals to 10,000 lb.; Duals with Cross to 5000 lb.; Triples to 10,000 lb.; Triples with Cross to 5000 lb.; Quadruples to 5000 lb.

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6001

CUT FUEL BILLS 20% WITH A LJUNGSTROM® AIR PREHEATER

The world's largest fluid catalytic cracker at Esso's Bayway Refinery is equipped with a new Ljungstrom Air Preheater. This picture shows the half-ton cold-end elements being installed in the Ljungstrom rotor.

Your biggest refinery operating expense is the money you burn: fuel costs. You can chop fuel bills ⅓ with a Ljungstrom Air Preheater, and here's how:

Your fuel bill drops about 1% for every 45-50°F you raise the temperature of combustion air. Ljungstroms now in service raise the air temperature 1000°F or more – and the rest is simple arithmetic. With a Ljungstrom, four barrels of fuel do the work of five. On fuel savings alone, one eastern refinery came up with net savings of $67,800 in the first year they used a Ljungstrom.

SAME FUEL, MORE HEAT. Ljungstrom economy is flexible economy. If total throughput is more important to you than fuel savings, a Ljungstrom can help boost the capacity of a pipe still at least 10% a day, without any increase in fuel consumption.

THESE ARE FACTS backed up by 25 years of Ljungstrom performance in refineries all over the world. But they're not the only facts. To find out about Ljungstrom's low-cost maintenance, easy inspection, in-service cleanability, space-saving compactness, call or write The Air Preheater Corporation for a free copy of a brochure called "The Ljungstrom Air Preheater for Process Equipment."

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Visco Chemical Stops Paraffin Build-up in Sixteen Gas-Lift Wells

Spray Injection of Visco 958 Into Gas-Lift Header Ends All Paraffin Cutting

Some said this field was "the worst" for paraffin, but for Visco, it provides a fine example of Visco treatment in action. Fifteen of sixteen gas-lift wells on one system in the area had to be shut down and cut frequently . . . some of them every other day. The sixteenth well – originally the most troublesome – was being slugged every fourth day with Visco 958 paraffin control chemical and kept clean. Even at these high build-up rates, the paraffin was hard in untreated wells, making cutting expensive and time-consuming.

Low Dosage Keeps Wells Paraffin-Free

To get protection for the other 15 wells, a Visco Representative recommended feeding Visco 958 into the main gas-lift header on the high side of the compressor. A chemical proportioning pump and Visco's Retractable Atomizing Spray Injector were installed.

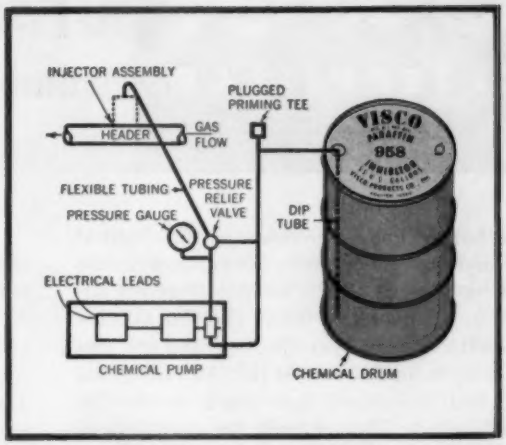
Initial dosage was 4 gallons (1 quart per well) Visco 958 per day, mixed and injected with 35 gallons of diesel fuel oil. Three weeks later dosage was cut to 2 gallons (1 pint per well) in 20 gallons fuel oil. One month after starting Visco 958 treatment, all mechanical cutting of the wells was stopped, and has not been resumed in over a year.

Winter Heat Bonus

Last winter, for the first time on this lease, the Production Superintendent was able to eliminate steaming of surface equipment: No paraffin to require "melting off" pipe surfaces, separators and valves.

Stock Tanks Clean

Visco 958 treatment has eliminated all paraffin bottoms in stock tanks. Spray-injection of chemical into the gas-lift stream gives 958 the chance to work effectively from well bottoms clear through the system to the pipeline valves. The Visco Field Service Man on this job reports that the Production Superintendent says he is still "a little amazed" at the complete disappearance of paraffin troubles in the "worst field."



Feeding Visco 958 through a special chemical injector, installed as diagramed above, proved a successful solution to this difficult paraffin control problem. Particularly well suited to certain types of applications, the Visco Retractable Atomizing Chemical Injector is a new method of chemical application . . . gives Visco Representatives an extra choice when working out the most efficient and economical program to end your paraffin problem.

How Visco 958 Works

A complex, semi-polar organic liquid, Visco 958 is a powerful paraffin dispersant. It also functions as a stabilizer of dispersed paraffins . . . keeps them harmlessly suspended in the oil. This stabilizing action not only assures full fluidity of tanked oil, but also pipeline acceptance without reservation.

Whether your paraffin problems are in wells, lead lines or stock tanks . . . or, as in this case, *in all three* . . . you should investigate Visco 958. You'll like its low pour point, high flash point, and the fact that it is completely free of heavy metals and all organic halides!

Put Visco on the Tough Ones

A real trial of paraffin control effectiveness and economy is testing Visco on your tough ones. Hand your Visco Representative your paraffin problems, and let him prove that Visco Paraffin Control can do an outstanding job for you.

VISCO PRODUCTS COMPANY
Incorporated
A Unit of Nalco Chemical Company
1020 Holcombe Boulevard **Houston 25, Texas**
Deutsche Nalco-Chemie, G.m.b.H., Frankfort, Germany
Nalco Italiana, S.p.A., Rome, Italy
Nalco de Mexico, S.A. de C.V., Mexico, D.F., Mexico
Nalco de Venezuela, C.A., Caracas, Venezuela
Visco® . . . Serving the Oil Industry through Practical Applied Science

engine power BY CATERPILLAR

UP GO HORSEPOWER

Turbocharging plus aftercooling now mean even more engine

Add a turbocharger and aftercooler to Cat Natural Gas Engines and you get 90 more horsepower on the G397 . . . now rated at 560 HP. You get 70 added HP from the G375, or a total of 380. The Cat G342—industry pacesetter for low operating cost and low purchase price—is up from 235 to 280 HP. All ratings are *continuous*. And remember, you don't derate Cat Natural Gas Engines. They're built for tough diesel service, then modified for lighter gaseous fuels.

WHY NO DERATING

You may remember when all naturally aspirated engines —diesel *and* gas—were derated to 65%-80% when they were converted to gaseous-fuel operation. And with good reason. But Caterpillar's investment of years of study, millions of research dollars and, the technological advances in materials and technique that have resulted, make derating no longer necessary.

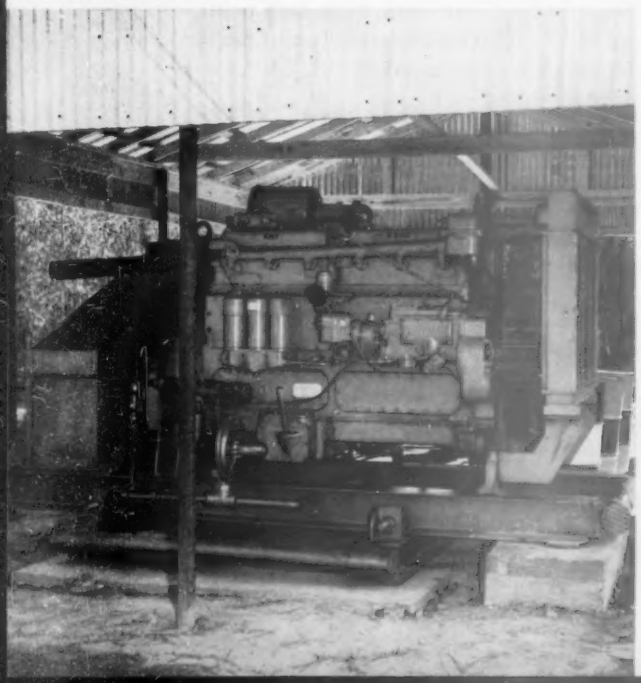
Even today, engines employing soft crankshafts and bearings, with only medium load carrying ability, must still be coddled when you talk rating.

Cat Diesels, for instance, proved that they could carry the load under 15:1 compression ratio with a manifold pressure of 55 inches of mercury (absolute). Natural gas engines have less demanding compression ratios and a manifold pressure of roughly half that for diesels—or about 28 inches of mercury (absolute). You can see from this that Caterpillar bearings are well under load design limits for natural gas service.

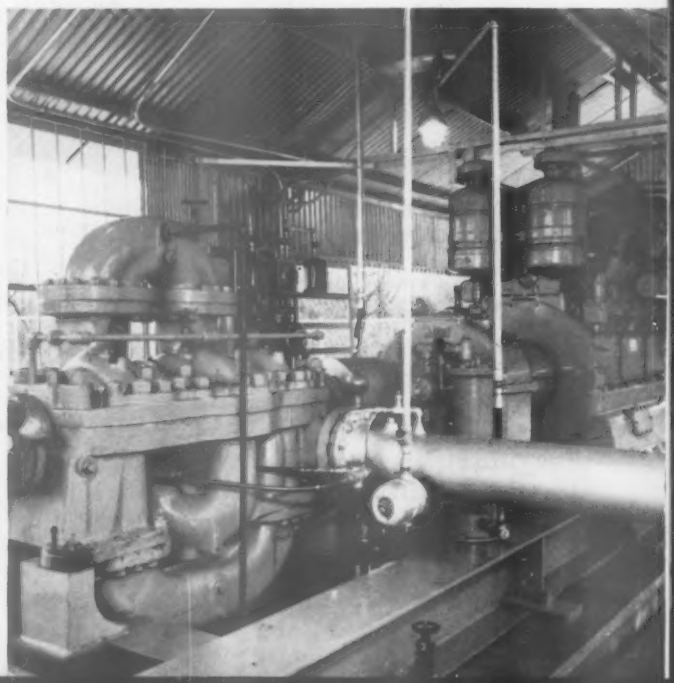
STRONG AND THEN SOME

Because Caterpillar puts a wide margin of safety and service into its diesels, you have a lot of insurance against stress in the natural gas version. Heat treating, special machining, and the materials we use in our crankshafts and bearings are just 3 reasons for this added stamina. For instance, in cranks we use a selected alloy steel, processed to our specifications. We harden journals to Shore 54-62, approximately .150 inch deep, and superfinish them with microhoning. All fillets have large radii and are carefully ground and polished. We statically *and* dynamically balance *all*

Vanson Production Corporation chose a G342 to power this 8¼ x 13 Worthington compressor, upon recommendation and engineering data furnished by the fabricator, Ingersoll Mfg. Co., Inc., of Shreveport, Louisiana.



This G397 powers an Ingersoll-Rand pump at Tyler, Texas, for Texas Eastern Transmission Corporation. The unit pumps 1000 barrels per hour of kerosene, fuel oil, gasoline and jet fuel from Tyler to Carthage, Texas, and on to the "Little Big Inch" pipeline.



RATINGS FOR CAT NATURAL GAS ENGINES

when you specify a Cat Natural Gas Engine. And they're still the world's lowest cost power producers...

crankshafts to smooth away vibration. Torsional vibration dampers reduce torsion stresses to low levels.

CONSTANT IMPROVEMENT

Over ten years ago, we proved that babbitt hadn't the heart for carrying the load in then-current diesels. Neither did copper-lead. Our solution was aluminum bearing materials which resulted in bearings that some experts call the most successful on the market today.

We do even more to build-in staying power. Cylinder liners are full length and water cooled. They're "Hi-Electro" hardened to a depth of approximately .060 inch to a Rockwell C47-55. Permanent mold aluminum pistons that have a wear-resistant, cast-in iron top ring band are used in Cat Engines. The oil-jet cooling on the underside of the piston head and the piston design itself are made for the rigors of diesel rather than the less strenuous natural gas use.

EITHER WAY YOU CHOOSE

The net result of all of Caterpillar's extra design and construction is a natural gas engine of exceptional performance ability. Not only is it the most engine . . . it's the most value. Cat Natural Gas Engines are the world's lowest cost power producers. No matter how you buy—on price or performance—your best buy is Caterpillar. We realize we can't answer all of your questions in just this space, nor can we provide all of the information you need in order to completely evaluate Cat Natural Gas Engines for your oilfield work. Write us for a copy of "Cat Natural Gas Engines." Or, if you would prefer, call in your Caterpillar Dealer before you buy your next engine. Remember, too, to specify Cat power in new oilfield equipment.

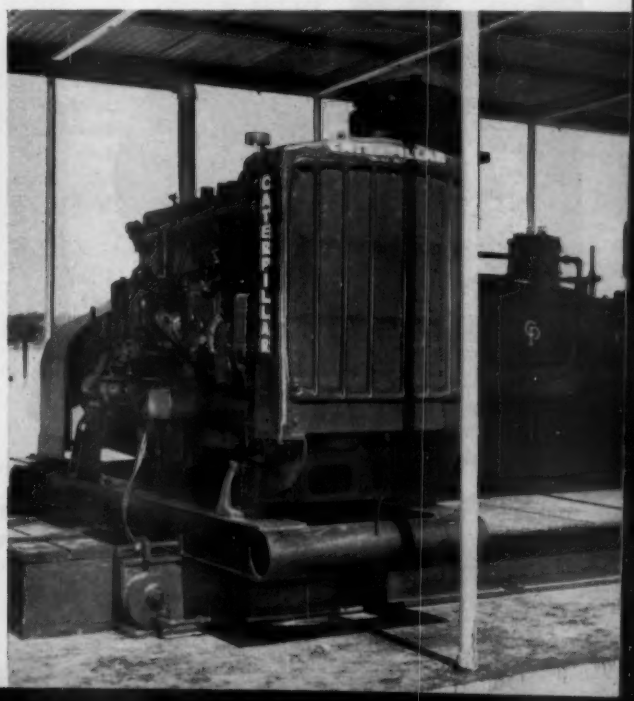
CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U. S. A.

A Cat G342 equipped with a CFA2 Clark compressor handles 1,500,000 cubic feet of natural gas per twenty-four hours at booster station operated by Texkan Oil Co., near Alice, Texas. The 7.5:1 pistons were selected for operation on available field gases.

Northern Pump Co. of Minneapolis, Minn., powers a Chicago Pneumatic compressor with this Caterpillar G342. This unit puts 1¼ million cubic feet per twenty-four hours of excess gas from four producing wells into an injection well near Beeville, Texas.



Vogt

ANOTHER Vogt FIRST

9 NEW FLANGED END FORGED STEEL

GENERAL GP PURPOSE

Gate, Globe and Check VALVES

with

HARD FACED SEATS
150, 300 and 600 ASA STANDARD

featuring:

ASA Standard flanges and face-to-face dimensions
*Stellite hard faced seats and hardened wedges and discs
Spiral wound body-bonnet gaskets
Stainless steel gland studs and nuts
Interchangeable parts
Light weight with maximum strength
Complete line—pressures, sizes and types

*Union Carbide Corp.

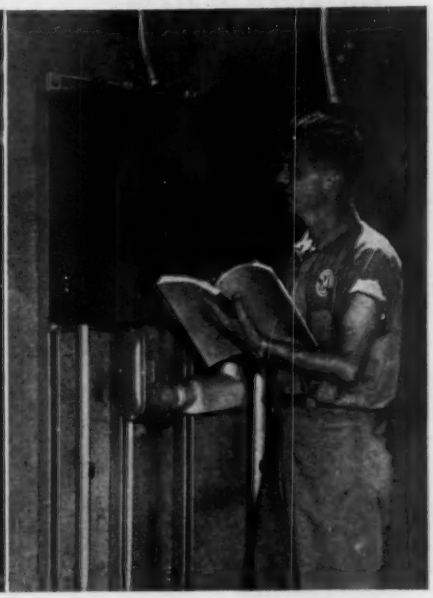
Write for Literature. Address Dept. 2A-E.O.

Vogt GENERAL GP PURPOSE Vogt FOR BETTER VALVES

HENRY VOGT MACHINE CO., BOX 1918, LOUISVILLE 1, KY.
SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J.
St. Louis, Charleston, W. Va., Cincinnati

FORGED STEEL
VALVES

The Current Revolution



Silicone Insulated Equipment Brings Economy, Flexibility

Chances are you've heard of the current revolution in electrical equipment . . . of outdoor motors stripped of weatherproof housings . . . of motors that laugh at overloads . . . of smaller, lightweight transformers that put power right where you want it.

These developments typify three phases of today's growing trend toward electrical equipment that's more reliable and easier to install . . . less expensive initially and in the long run.

Phase I — Self-Protecting Insulation Cuts Motor Costs

Motors need no costly enclosures . . . even outdoors . . . when they've got self-protecting insulation systems. The insulation system itself, when made with Silastic®, the Dow Corning silicone rubber, shrugs off weather, humidity, corrosion . . . is no longer the "weak-link" to be coddled. Result: There's no need for the elaborate enclosures that push motor prices out of sight. Open motors do the job — costs are cut as much as 50%! Proof: One firm saved $28,000 on only three motors by specifying silicone insulated open motors rather than totally-enclosed fan-cooled units.

Phase II — Increased Service Factor Motors Reduce Power Costs

Motors with insulation systems that don't get "burned-up" when asked to carry overloads . . . that's one way of describing motors built with Dow Corning Silicones for extra service factor. When the going gets rough and production schedules are critical, they carry overloads of twenty-five to fifty percent beyond nominal rating . . . without distressing smoke signals. And though they deliver more horsepower when needed, they're still no bigger than their conventional counterparts . . . have the same nameplate horsepower rating. Result: You specify motors to match load, let silicones carry the overloads. No need for larger, more expensive motors just to handle occasional overloads . . . and you gain in reliability, too.

Phase III — Silicone Insulated Transformers Give Power Where You Want It . . . At Less Expense

New dry-type transformers insulated with silicones contain no toxic or flammable liquids. They're smaller, lighter . . . don't require expensive vaults or barriers. Result: Silicone insulated transformers are easier to handle, easier to install, can be located right at load or load center, need almost no maintenance. They save on costly low-voltage cable, too. You get greater flexibility of the distribution system and cut costs at the same time.

KEEP PACE WITH THE BIG CHANGE

Send today for the booklet, "Specify Silicone Insulated Motors and Transformers and Save", and get the full story on the current revolution in electrical equipment. Address Dept. 6211.

SPECIFY Dow Corning Silicones and SAVE!

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Reporting more news from . . .

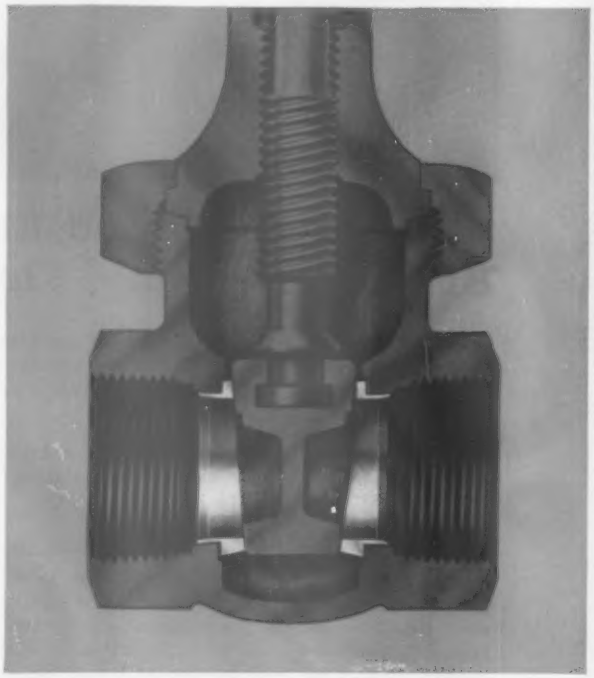
CRANE
DIRECTION '70

. . . a fast-moving program of planned expansion, product development, and streamlined distribution to help our customers meet the competitive challenges of the Sixties.

Only from Crane—this rugged bronze valve in a full range of pressure classes and sizes

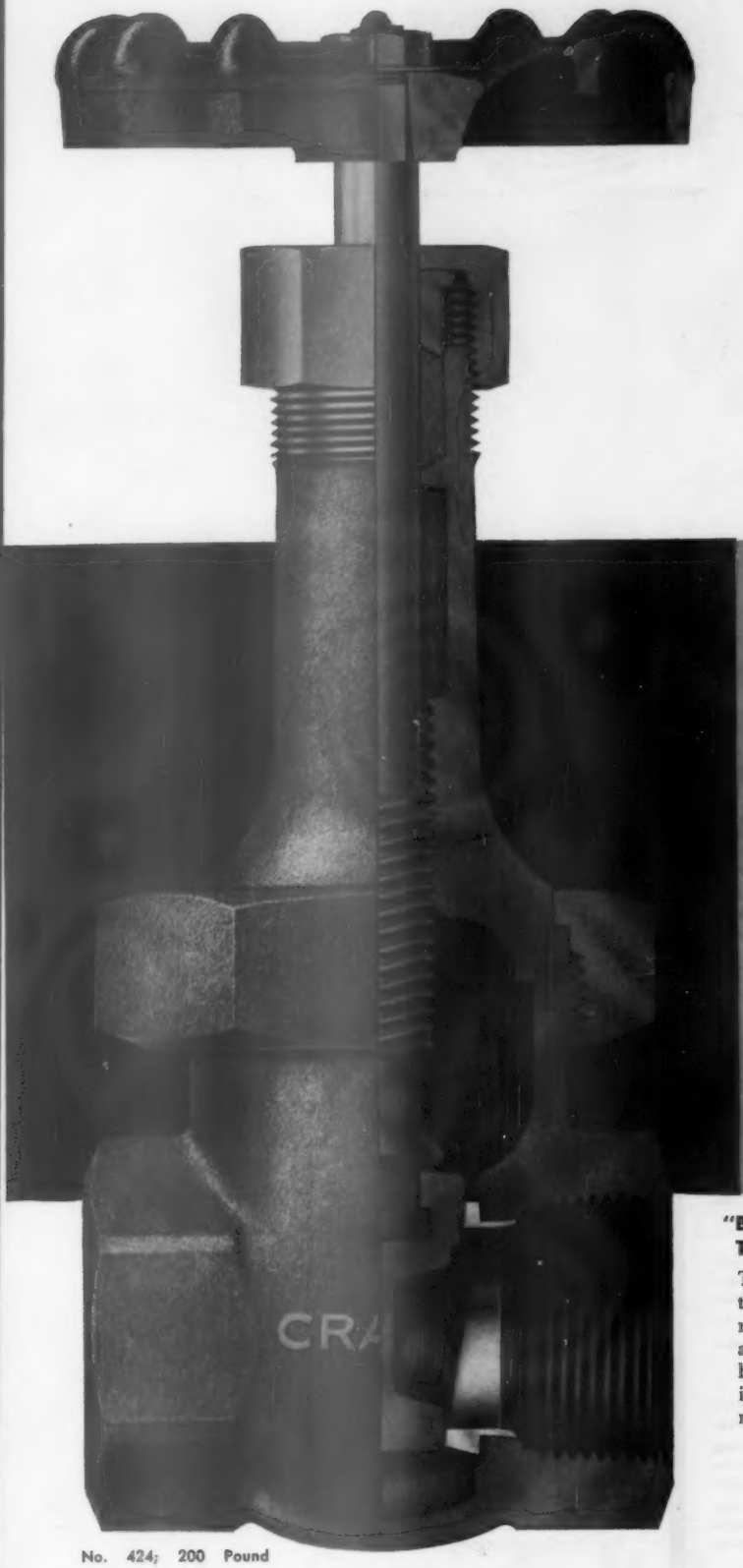
Use these on your toughest services! Here are valves with a built-in safety factor that far exceeds minimum standards. Modern, cylindrical body design—the same as used on high-pressure steel valves—gives you extra protection against body distortion that causes leaks. Crane Exelloy seat rings defy operating wear and damage from foreign matter... drastically reduce your valve maintenance costs. And you get this extra performance at no more cost than you pay for a valve built to only minimum standards.

In addition to all these quality features, Crane gives you a far wider selection than any other comparable bronze valve line . . . a full range of sizes from ¼" to 3" . . . in both 200-pound and 300-pound pressure classes . . . in both rising stem and non-rising stem patterns. Your local Crane Distributor has these valves in stock and can ship your order without delay.

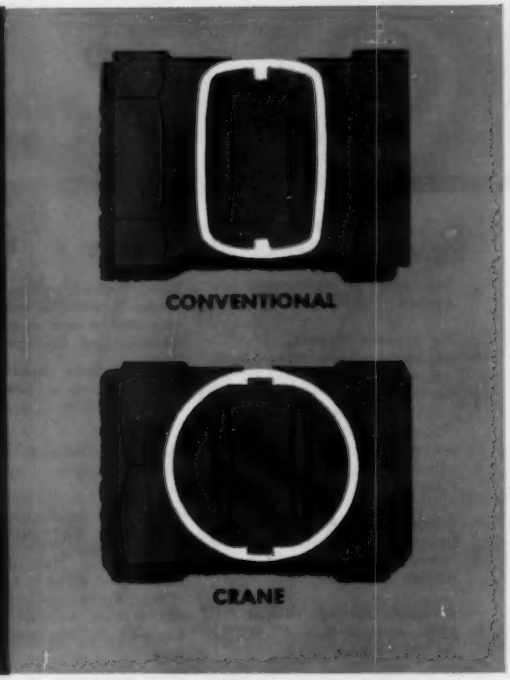


THANKS TO EXELLOY SEATS, ONLY THE REPLACEABLE DISC GETS THE WEAR

Crane Exelloy (12% chromium steel) seat rings, expanded into body, give a hard bearing surface with superior resistance to wear, indentation, or scoring. Normal seating wear is shifted to the easily replaceable bronze wedge disc. Ordinary bronze valves wear on both disc and seat, an expensive maintenance factor. But with this Crane bronze valve you need only slip in a new disc to get a like-new, tight-seating valve.



No. 424; 200 Pound
No. 634E; 300 Pound



"BEEFED-UP" BODY DEFIES DISTORTION TO MAINTAIN TIGHT SEAL

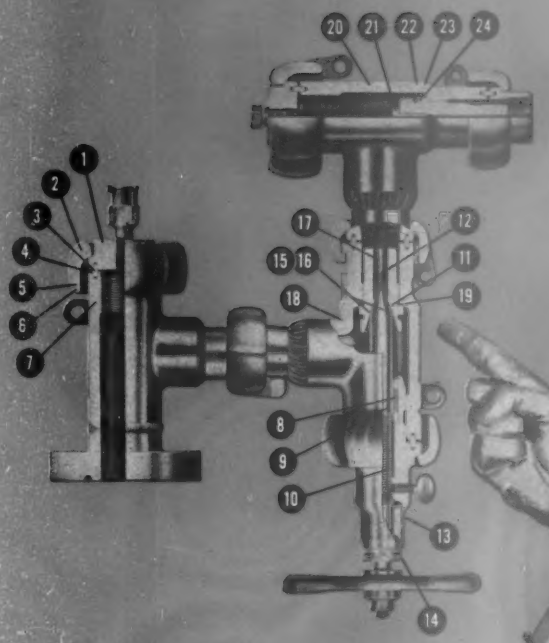
This Crane bronze gate valve has a cylindrical body . . . the best design to withstand internal pressures. Ordinary rectangular body design creates stress concentration at corners, which may result in distortion of the valve body causing leakage or early failure. Huskier, better integrated Crane design has more rigidity under strains, reinforces seats against wedging action of disc.

CRANE®

Crane Co., Industrial Products Group, 4100 S. Kedzie Ave., Chicago 32, Ill.

VALVES • ELECTRONIC CONTROLS • PIPING • PLUMBING • HEATING • AIR CONDITIONING

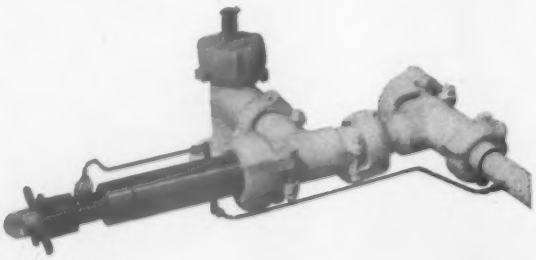
See how much more you get with a UNIBOLT Christmas tree flow manifold



These are the "Extras" that make UNIBOLT the best buy of all manifolds

1. Tee cannot be accidentally opened.
2. No exposed threads . . . no accidental damage.
3. Concealed seat in groove . . . no accidental damage.
4. All metal seat . . . not affected by high or low temperature.
5. Lubricators, bottom hole pressure adapters, and valves easily attached to Unibolt connection.
6. 2"—3000 lb. wp Unibolt 28% stronger than 2" — ser. 900 flange.
7. Unibolt stronger than tubing threads . . . ideal for working trees with welded lift nipple. Tubing threads in tee if desired.
8. Stem packing needs no tightening.
9. Stem turns freely under high pressures.
10. Threads on stem not exposed to external or internal damage.
11. Full 2½" pilot for true stem alignment and rigidity.
12. Streamlined flow — no obstructions . . . no turbulence.
13. Wing Valve requires no grease to effect a seal . . . may also be used as micrometer-gauged flow bean.
14. Variable choke speeds up initial clean-up or running initial flow tests . . . saves rig time.
15. Nitride hardened stem and stem seat . . . resists corrosion.
16. Choice of hard chrome plated or "SA" stainless stems and seats.
17. Unrestricted 1" opening in Wing Valve will pass 10,000 bbls. of fluid per day with 100 lbs. pressure drop.
18. Wing Valve can be completely overhauled without removal from tree.
19. Wing Valve stem seat sealed by power threads and metal gasket assure alignment.
20. Positive Choke Body takes regular or "X" Beans . . . all beans flow-rated.
21. Shaped entrance on beans prevents paraffin clogging.
22. Positive Choke Body may be replaced with inexpensive tee and cage nipple.
23. Positive Choke Body can be converted to Adjustable Wing Valve by substituting two parts.
24. Beans and stem seats have external hex for wrenching.

In addition to these distinctive features, the UNIBOLT Flow Manifold eliminates impingement of flow and negative pressure areas. It may be salvaged completely or as separate units. The three separate units provide flexibility in arrangement of connections. All parts are easily replaced in the field . . . all parts are interchangeable.

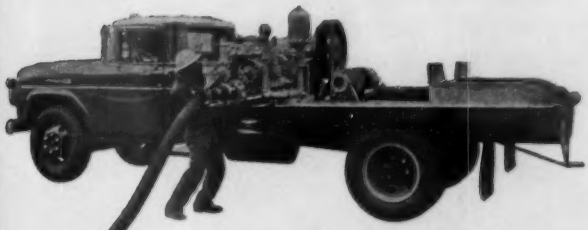


The valve in this manfold is the new UNIBOLT Pressurematic Valve which is a combination automatic high-low safety valve and manually-operated wing valve for choke changing.

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

Compactness of Super HC High Capacity V-Belt Drive was major factor in choice—saving of $33.75 was 'bonus'.



A product of Well Drilling Equipment Manufacturing, this truck rig with permanently mounted Gardner-Denver Mud Pump used in conjunction with Scott-Hycalog Power Swivel can be run right up to the job and be working in a matter of minutes.

with new High Capacity Drives

rig manufacturer SAVES

43% drive space
223 pounds drive weight
$33.75 drive cost

on each unit!

Conventional drives used on truck-mounted mud-pump rigs produced by Well Drilling Equipment Manufacturing, Inc., of Clare, Michigan, presented a problem: sheaves were too wide and too large in diameter to keep rig as compact as its designers wanted it to be.

Paul Scott, the company's President, considered other possibilities and finally chose Gates Super HC High Capacity V-Belt Drive to transmit power to the Gardner-Denver Mud Pump incorporated on each rig.

Result: face width of sheaves was not only reduced to 5-13/16 inches, a saving of 43% in space, but total drive weight was cut by 223 pounds, a saving of 48%! And a bonus was realized—the Super HC High Capacity Drive cost $33.75 LESS than the former drive.

Mr. Scott reports that, after seven months on their rigs in the field, Super HC High Capacity Drives have withstood all shock loads, with no maintenance whatsoever—and praises them further for "economy, pulling power, ease of assembly, appearance and compactness."

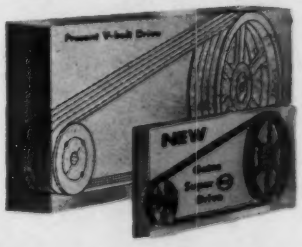
Stocks and Technical Assistance Available

Stocks of Gates Super HC High Capacity V-Belts and V-Belt Drives are located in all principal industrial centers—where you will also find a Gates Office or Gates Distributor ready to help you with any power-transmission problem involving drives. Look for them in the Yellow Pages of your phone book. Ask for Booklet: *The Modern Way to Design Multiple V-Belt Drives.*

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates The Mark of Specialized Research

TPA546



Gates Super HC HIGH CAPACITY V-Belt Drives same hp capacity in smaller "package"

NATIONAL BANK OF TULSA

Now our remodeling program at N. B. T. has been completed after many months of hard work. But we have done much more than just make physical changes. We sincerely believe that National Bank of Tulsa has created a New World of Banking. Our redesigned quarters exemplify modern banking's concept of full service, convenience and comfort for all our customers. The bank that was "born in the oil field" cordially invites oil men everywhere to enter A New World of Banking.

A. E. Bradshaw
Chairman of the Board

NATIONAL BANK OF TULSA INVITES YOU TO ENTER A NEW WORLD OF BANKING

member federal deposit insurance corporation

There are many advantages to buying workmen's compensation insurance from TEIA. One is that TEIA serves you directly through full-time salaried representatives. When you deal with these highly trained experts you are dealing directly with TEIA. This means faster, more complete service to you.

Deal direct . . . call the nearest TEIA man.

TEIA

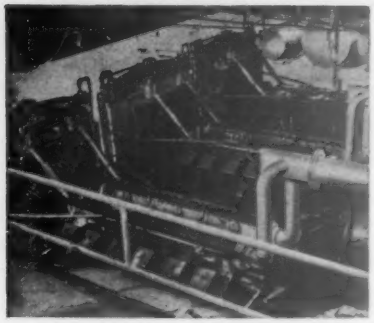
TEXAS EMPLOYERS' INSURANCE ASSOCIATION

First Choice with Texas Industry for over 45 years

HOME OFFICE: DALLAS | 25 SERVICE OFFICES IN TEXAS | AUSTIN F. ALLEN, CHAIRMAN OF THE BOARD | BEN H. MITCHELL, PRESIDENT

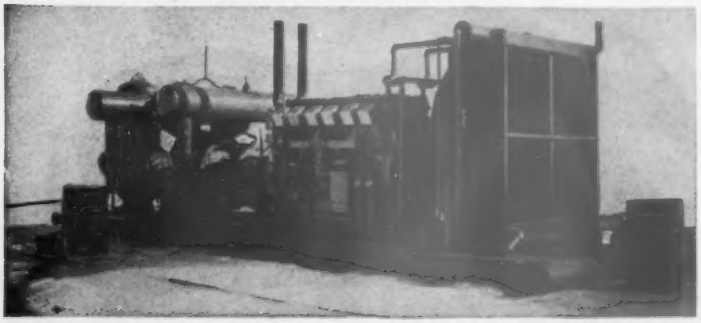
it's CLIMAX

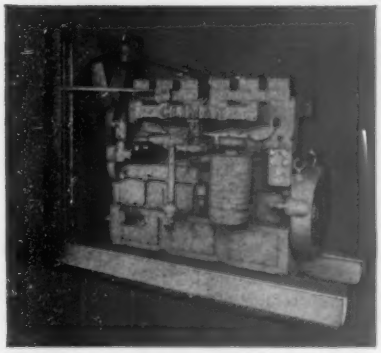
for DRILLING and PUMPING

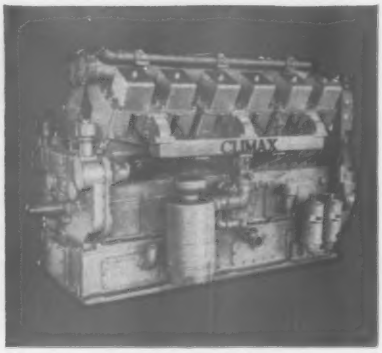


● Climax Engines have proven their reliability in hundreds of oil field installations. Single, well balanced design, rugged construction, and quality materials make them smooth running . . . for years!

for COMPRESSORS







Model K-67—Max. hp 265 (Natural Gas)

Model V-125—Max. hp 605 (Natural Gas)

Model V-85—Max. hp 390 (Natural Gas)

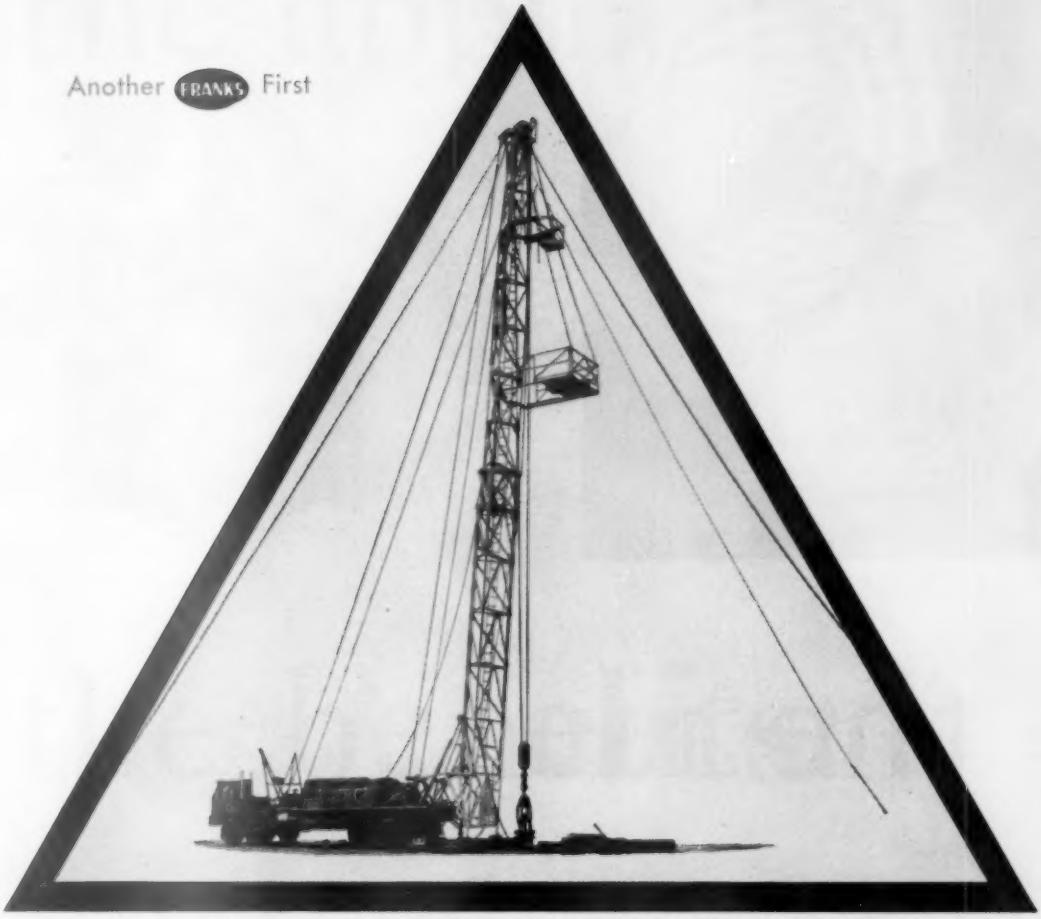
CL-116

CONT. DUTY (NAT. GAS) →			DRILLING-PUMPING (80% RATINGS)						COMPRESSORS (65% RATINGS)				
Model	Bore & Stroke	Displ.	Peak Torque @ RPM	Brake hp at Speeds Indicated					Peak Torque @ RPM	Brake hp at Speeds Indicated			
				600	800	900	1000	1100		800	900	1000	1030
K-165	6⅛ x 7	1238	684 @ 750	81	105	117	127	135	557 @ 800	85	95	103	105
K-67	7 x 7	1616	955 @ 850	110	145	161	176	188	775 @ 800	118	131	143	146
K-75	7½ x 7	1855	1090 @ 800	126	166	185	204	218	885 @ 800	135	151	166	169
V-80	7 x 7	2155	1240 @ 850	140	188	210	230	246	1002 @ 800	153	171	187	190
V-85	7½ x 7	2474	1460 @ 800	164	223	246	266	284	1185 @ 800	181	200	216	221
V-122	7 x 7	3232	1920 @ 800	217	293	328	353	378	1562 @ 800	238	265	288	293
V-125	7½ x 7	3711	2240 @ 850	242	340	384	417	442	1820 @ 900	276	312	340	346

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY

FACTORY—CLINTON, IOWA

Another FRANKS First



The advanced triangular TRI▲SCOPE DERRICK!

Replaces the Double Pole Mast where it is desirable to pull doubles for rod and tubing work.

HANG RODS • RACK PIPE

Greater speed with features such as automatically positioning rod and stacking boards. Top section automatically locks into position.

GREATER STRENGTH

Triangular construction gives greater strength with less weight. Rated 100,000# with 2-to-1 safety factor. 90′ derrick.

LESS GUYING

Minimum guying required for wind protection only. Rigs up faster than clumsy 87 ft. double pole.

HYDRAULICALLY RAISED POWER EXTENDED

Single hydraulic ram raises mast. Excellent visibility adds to many other safety features.

Call your Franks representative for the exciting details, or write for specifications folder.

WELL SERVICING AND DRILLING UNITS

FRANKS

PAMPA, TEXAS

CABOT

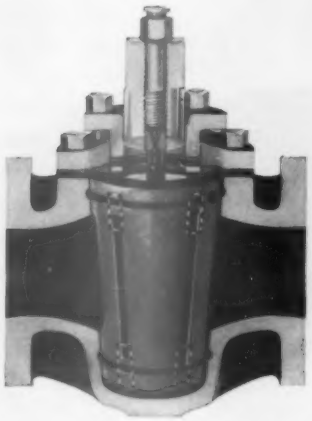
CABOT CORPORATION
MACHINERY DIVISION

the idea:

Force Can Be Multiplied Through Hydraulics

Blaise Pascal in 1625 demonstrated that a given force can be multiplied almost infinitely through use of hydraulics. His principle: "a unit pressure applied to the liquid contained in a sealed vessel is transmitted to every part of the liquid with undiminished force, thus multiplying the force many times . . ."

the application:



How It Helps Give You A Better Valve

In the Rockwell-Nordstrom valve (the *original* lubricated plug type), lubricant is injected under pressure creating powerful instantly replaceable seals against leakage in the Sealdport® grooves between plug and body. Lubricant also hydraulically jacks and balances the plug to maintain perfect seating, instant operation.

the benefits:

Positive Shut-Off . . . Instant 1/4-Turn Operation . . . Unexposed Seating, Longer Life, Lower Cost

For a full range of services, Rockwell-Nordstrom lubricated plug valves insure the trouble-free operation and freedom from wear and repair that you can only expect from a *lubricated* mechanism. See your supplier or write for complete details on Rockwell-Nordstrom lubricated plug valves, lubricants and operating accessories. Or better yet, have a Rockwell field engineer visit you. Rockwell Manufacturing Company, Dept. 92-L, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International S.A., Geneva, Switzerland.

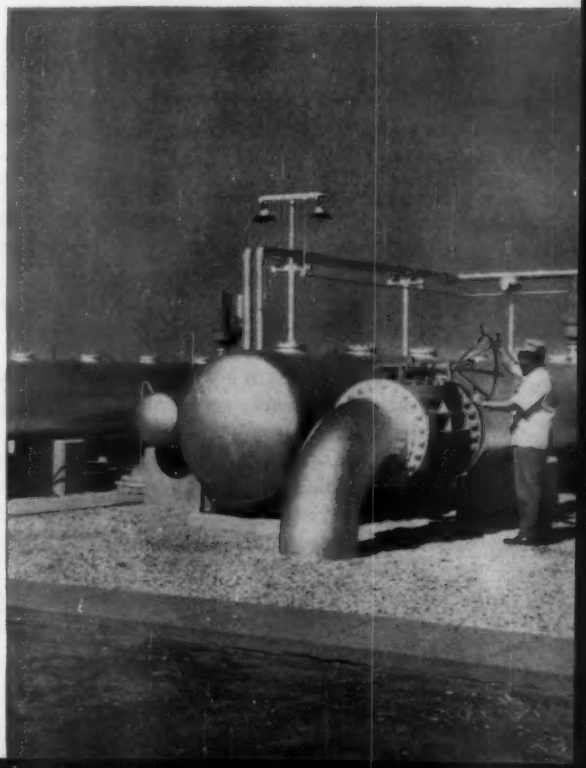
Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

Rockwell-Nordstrom pipeline valves close 2 to 5 times faster than non-lubricated valves. Powerful positive seals of pressurized lubricant assure leak proof operation.



Would you spend an extra 10%

to double roller chain life?

Morse H-E Roller Chain overcomes metal fatigue . . .

lasts from 2 to 5 times longer . . .

costs only 10 per cent more than ordinary roller chain!

Yes, now by paying just a slight premium you can buy Morse H-E (high endurance) roller chain . . . and get 2 to 5 times the service life over ordinary chain. You'll save thousands of dollars annually on tough drilling jobs. Here's why:

Normal roller chain breaks under heavy strain in oil-field applications. It's this "tired metal" problem that plagues anyone who has used roller chain. Morse has developed a process to overcome metal fatigue. As a result, Morse H-E Roller Chain has a 95% greater endurance limit . . . lasts up to 500% longer . . . costs just 10% more.

Morse H-E Roller Chain is available from 1″ through 2½″ pitch, standard and heavy series, single and multiple widths. Make a test on your own rig. Your local supply store is the place to start. Or write: Morse Chain Company, Dept. 22-110, Ithaca, N.Y. Warehouses in Houston and Los Angeles. Export Sales: Borg-Warner Intl., Chicago 3, Ill. In Canada: Morse Chain of Canada, Ltd., Simcoe, Ont.

ORDINARY CHAIN BREAKS when the side plate tires from repetitive loading and unloading during the cycle around the sprockets. But Morse H-E Roller Chain has a 95% higher endurance limit . . . outlasts ordinary chain by up to 5 to 1 under repeated loading.

MORSE BW T.M.

A BORG-WARNER INDUSTRY

ONLY MORSE OFFERS ALL FOUR: Roller Chain, Silent Chain, Hy-Vo® and "Timing"® Belts

A Nalco PRODUCT MANAGER

Answers Questions about Cooling Tower Deterioration And Other Microbiological Problems

More Knowledge, Better Chemical Controls Offer New Paths to Economical Tower Treatment

Since cooling towers offer many types of fungi and bacteria choice conditions for growth, the battle for microbiological control is a continuing one throughout the country.

Nalco approaches cooling tower protection as part of the overall job of keeping the entire cooling system free of scale, corrosion, and microbiological growths of all kinds. Such a complete program is essential for most efficient cooling tower and system operation.

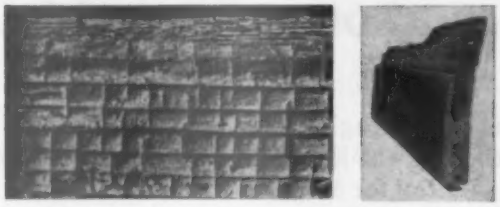
Here are some of the frequently-asked questions about cooling tower deterioration; and the answers we believe to be accurate.

Question: How can you tell when wood is being attacked chemically or microbiologically?

Answer. Careful tower inspection, plus microbiological analyses of wood from various parts of the tower (framing, fill, mist eliminator, top deck, and stack), and from samples of cooling water.

Question: Is wood deterioration common to certain parts of towers?

Answer. No. Microbiological attacks may occur in any part of the tower. Internal decay or deep rot is common to non-water-washed sections; while surface decay or chemical attack may occur anywhere in the system.



Wood deterioration samples from cooling towers. Left, cross checked surface decay; right, deep internal rot.

Question: Does tower location make any difference?

Answer: Apparently not. Towers throughout the world have been attacked.

Question: What types of organisms produce wood decay?

Answer: The same ones that produce forest decay. Organisms of the Fungi Imperfecti class cause both surface decay and internal rot. Deep rot is also caused by fungus organisms of the Basiodiomycetes class. Both classes are cellulolytic organisms—cellulose eaters, in effect, as they convert cellulose for nutrient uses, and in so doing, weaken the wood to the point of eventual collapse.

Question: Does chlorine predispose wood to microbiological decay?

Answer: There are considerable data, gathered by interested independent organizations, indicating that deterioration is prevalent in towers using chlorine as an algicide and bactericide. Whether chlorine predisposes wood to decay has not been fully established. However, actual plant experience indicates that a non-oxidizing microbiological program can provide control of wood deterioration. Nalco non-oxidizing microbiocides can also be used to provide protection against decay where chlorine is a part of the overall control program.

E. H. Hurst, Product Manager, Water Stabilization Chemicals, Nalco Chemical Company

Question: Do any chemicals do a complete job of microbiological control in cooling towers?

Answer: Yes. A Nalco program of non-oxidizing microbiocides designed and engineered for your plant problems can provide complete control against all types of microbiological activity . . . slime, algae, corrosive bacteria and wood decaying organisms.

Question: Do these non-oxidizing microbiocides *stay* effective? Economically?

Answer: Yes, although changes or additions in the types of organisms present may change the type or dosage of treatment used. Nalco programs have the flexibility required to meet such changes and maintain effective control. Long-range economy of a Nalco program for complete cooling system protection is being demonstrated in hundreds of systems—some of them for twenty years or more!

Question: Is this the whole story on microbiological control and deterioration?

Answer: It is hardly a beginning! Details on Nalco chemicals and services, and specific programs for cooling system protection are available promptly from your Nalco Representative. Ask him about the searching, comprehensive surveys and analyses made before a program is recommended . . . About the continuing surveillance of program effectiveness and economy . . . And let him show you, specifically, what Nalco can do for you.

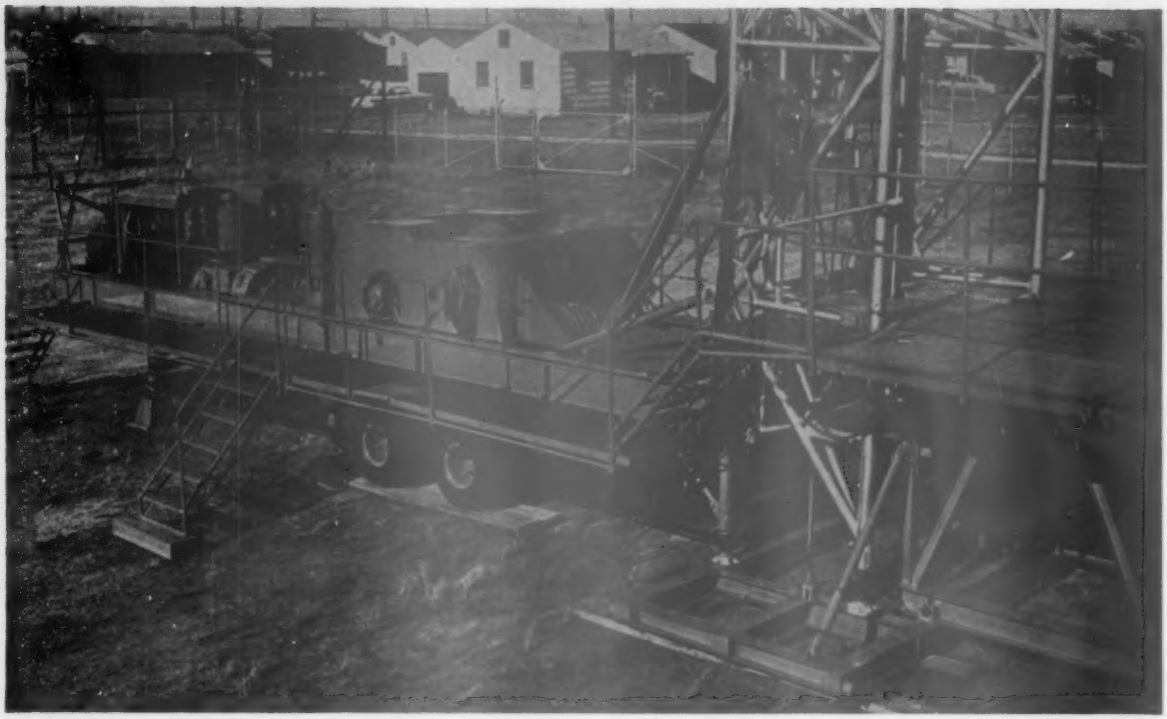
On request: An illustrated, 8-page report on "Cooling Tower Deterioration . . . Its Causes, Symptoms, and Suggested Cures." Ask for Nalco reprint No. 85.

NALCO CHEMICAL COMPANY
6242 West 66th Place • Chicago 38, Illinois
Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany
In Canada—Alchem Limited, Burlington, Ontario

nalco® ... Serving Industry through Practical Applied Science

Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES

Better products, *faster*, from your Federal-Mogul jobber:



Federal-Mogul Engine Bearings keep power at a peak longer... over the road or in the fields!

"Jewels of the engine" and first choice of skilled mechanics who know the value of perfect oil control for long-life service

Whether your operation calls for portable rigs or stationary power, your engines must deliver full output to transport heavy equipment or for drilling. Federal-Mogul sintered engine bearings are precision-made to stand the shocks and give good service under all conditions. They are made under a patented process in five layers . . . 1. Steel back for strength and bond; 2. Copper-lead sintered lining; 3. Brass barrier for stability; 4. Lead-tin overplate for smoother "break-in"; 5. Pure tin flash plating for corrosion resistance.

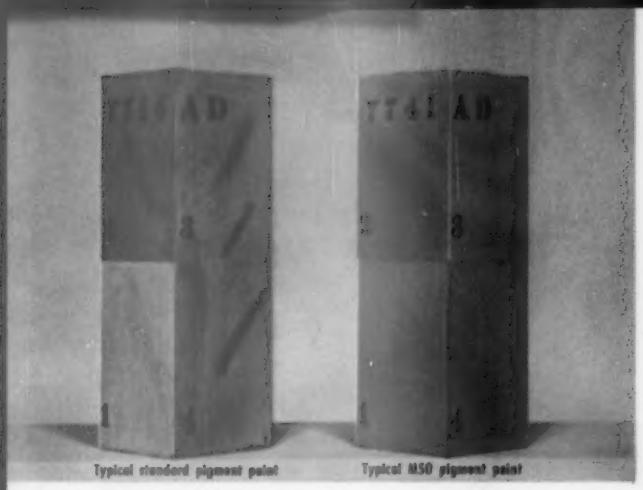
Let your nearby jobber supply you with these longer-life, quality bearings for all replacements. He'll see you get fast service.

FEDERAL-MOGUL ENGINE BEARINGS

BEARING FEDERAL Mogul SERVICE

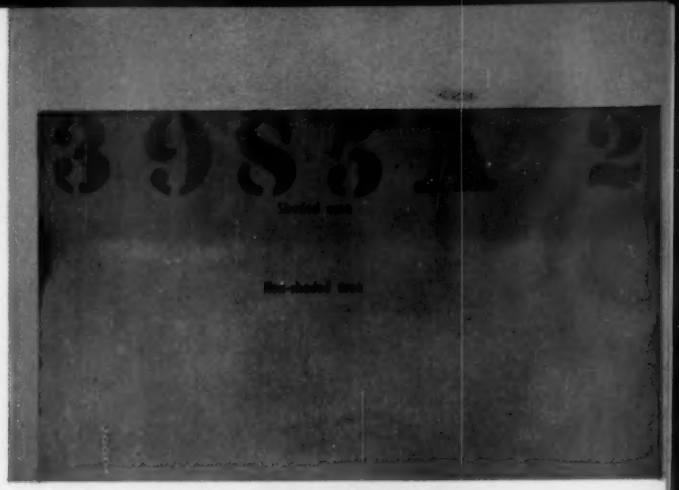
FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN



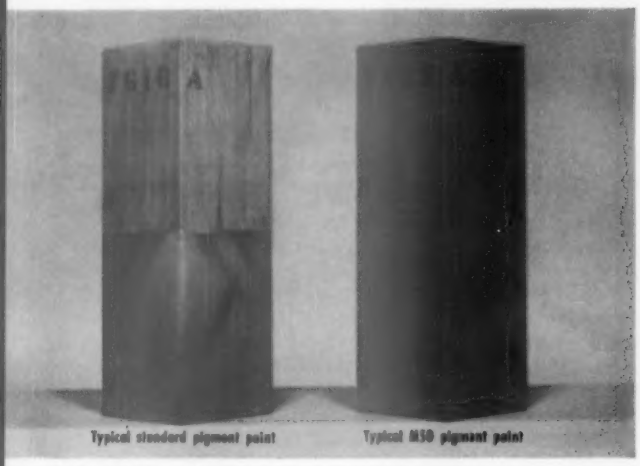
No objectionable whitening from chalking

Contrast these two exposure test panels . . . both show comparable metal finish paints. Same original colors. Same exposure (45° South, 2 yrs., 3 mos.). Notice bright color of *M50* paint, freedom from chalk.



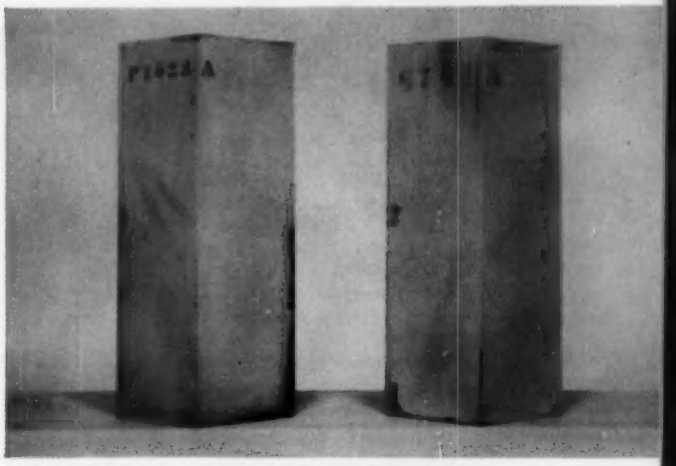
No appreciable fading from light action

Now look at this 9-year exposure test panel of an *M50* paint. Contrast area shaded by wooden panel holder with non-shaded area. Clearly, there has been practically no fading in this 9-year period.



No leaching from water action

Examine the exposure panel at left. Notice the vertical brushmarks? Rain water leaching of the top coat permits brushmarks in undercoat to show through. In the panel at right, insoluble *M50* pigment prevents this film failure. Exposure 45° South, 2 yrs., 7 mos.



No discoloration in industrial atmosphere

Here are two exposure panels painted from the same can of *M50* paint. Both have been exposed 4 years, 45° South. The right one in normal atmosphere, the other in sulfur-laden industrial atmosphere. Notice no color difference has developed. No bilging.

Proof you get unique color stability in metal protective paints made with M50® pigment

Drilling equipment looks better, needs less maintenance painting when painted with colorful *M50* anti-corrosion paints.

No need to amplify what the four illustrations above show. Plainly, *M50* basic lead silico chromate pigment permits your paint supplier to make paints with more color stability than ever before available in anti-corrosion paints . . . primers as well as finishes.

National Lead exposure tests demonstrate that these paints . . . both standard and deep-coat . . . also provide better and longer lasting anti-corrosion action, and never-before weather resistance. Some of the opportunities these new *M50* paints present are suggested on the following page. You'll think of others.

M50 *an* **oncor** TRADEMARK *pigment development of*

National Lead Company

111 Broadway, New York 6, N. Y.

Public relations.
Attractive tank farms that *stay* attractive longer.

Product identification.
Color-coded drums that *stay* colorful longer.

Two ways to make good use of the superior color stability of M50 pigment anti-corrosion paints

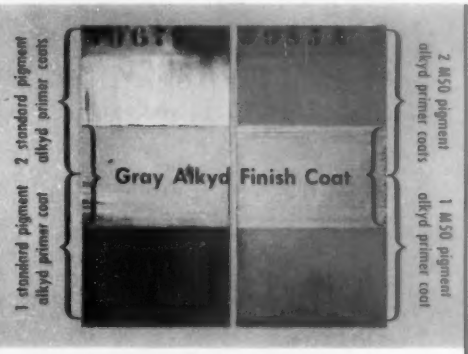
Before the advent of *M50* pigment, those responsible for maintenance painting had to make a choice between colorful appearance and long-lasting corrosion protection.

With *M50* pigment paints, exposure experience proves, this compromise is no longer necessary. *M50* paints have weather resistance . . . stay bright and colorful . . . and *at the same time* provide superior corrosion protection. With these unusual paints, color stability problems . . . leaching, fading, whitening, darkening from bilging . . . are eliminated. Now, with *M50* paints, you can have maximum anti-corrosion, maximum durability and, at the same time, long-lasting good appearance.

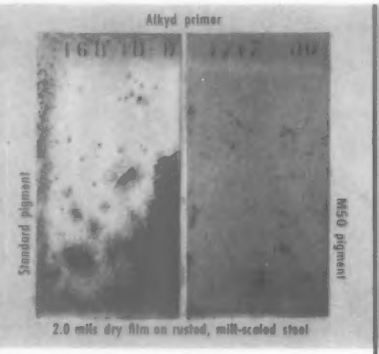
The illustrations above suggest two areas in which the combination of superior anti-corrosion action and superior color stability found in *M50* pigment paints can pay off handsomely. Note that in both, service is severe and colorful colors are needed. With *M50* paints, you repaint less often.

In your own operations there are bound to be many similar applications where specification of *M50* paints can lower your maintenance painting costs. Ask your regular paint supplier to make up suitable *M50* paints for your requirements.

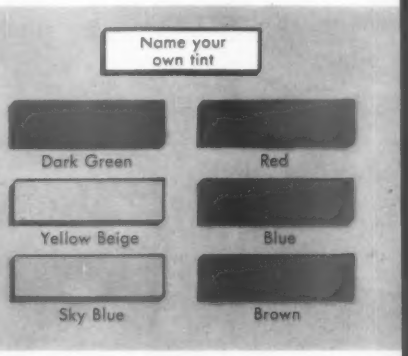
Why M50 Defense in Depth paints give anti-corrosion beyond all former concepts


2 standard pigment alkyd primer coats
Gray Alkyd Finish Coat
1 standard pigment alkyd primer coat
2 M50 pigment alkyd primer coats
1 M50 pigment alkyd primer coat

Exposed 9 years, 45°S. Each coat 1.5 mils
Proved corrosion and weather resistance



Exposed 45°S; 1 yr ind. atmos., 1 yr normal atmos.
Proved outstanding for film strength, durability



Colors above available in conventional and heavy-coat paints
A wide range of stable colors can be produced

Are you concerned with tank or structure maintenance painting in your firm? If so, you are invited: (1) to visit National Lead's Sayville, L.I. test station, where you will see the results of the 20 years research that lies behind the *M50* pigment particle and the more than 10 years of exposure testing that lies behind *M50* pigment Defense in Depth paints; (2) to send coupon below for National Lead booklet, "Defense in Depth" and typical *M50* tank paint specifications.

Next time you purchase, specify *M50* pigment paints. Any paint manufacturer can supply you.

M50 Defense in Depth

National Lead Company,
111 Broadway, New York 6, N. Y.

Gentlemen: Please send me the "Defense in Depth" booklet together with typical tank paint formulas and color chips that I can use in specifying M50-type tank paints.

Name_____ Title_____

Firm or Dept._____

Address_____

City_____ State_____

Why Solar designs industrial gas turbines to weigh between 1 and 1½ lb/hp

by Paul A. Pitt
Chief Engineer
Solar Aircraft Company

The weight of Solar gas turbines is the result of a design philosophy that is unique in the small gas turbine field.

Most gas turbine designs fall into one of two extreme categories. Aircraft-type engines, at one extreme, embody highly sophisticated techniques for extreme light weight in relation to horsepower, but have resulting short life. The opposite philosophy employs the ultra-massiveness of steam turbines to assure long life.

There are important disadvantages in both approaches when long life, reasonable cost, dependable operation, simple maintenance and easy transportation and installation are required. While aircraft-design engines (of ¼ to ½ hp/lb) can be modified and derated for longer service life, the resulting product is inherently delicate. This compromise inevitably results in short life.

Paul A. Pitt

On the other hand, massive design (of 10 lb/hp and up) leads to unnecessary structural bulk and introduces problems of thermal lag and distortion.

Since World War II, Solar has designed and built a variety of gas turbine units with characteristics that lead to both long life and low weight. The Saturn gas turbine engine, for example, is an 1100 hp unit intended specifically for industrial and military installations. It has a weight-to-power ratio of 1.1 to 1.4 lb/hp.

Although it is designed for long life, it utilizes only enough materials in its components to satisfy structural and thermal requirements. This approach resulted in a design that makes no compromises with durability and performance, yet meets the needs of industry for flexibility in a small package. It has an 1100 hp rating at a specific fuel consumption of 0.61 lb/hp-hr and a continuous rating of 1020 hp at 0.63 lb/hp-hr SFC.

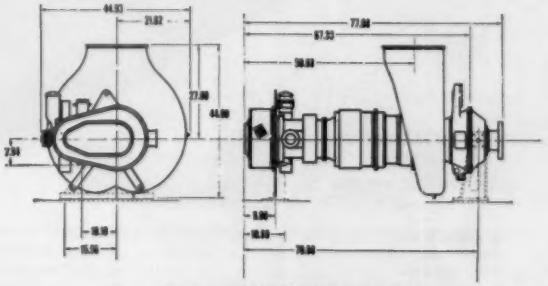
Meeting these objectives required an engine with a simple thermodynamic cycle and high efficiency components. An axial compressor was designed with an operating efficiency of 86%, and this was combined with a multi-stage, axial type turbine of advanced aerodynamic design. Over-all dimensions of the engine are shown in the figure below.

To fulfill workhorse service requirements, the engine was designed to operate at a conservative gas temperature of 1450 F continuous rating. The stress levels are also low, so that major rotating and stationary components will have more than 100,000 hours of life with long periods between overhaul. To keep costs down and assure dependability, the engine design is simple and straightforward.

In brief, the development program of the Saturn turbine adhered to three principles: Careful aerodynamic design for high performance; use of moderate temperatures and low stress levels for long life; and exhaustive component testing for ruggedness and reliability.

Presently scheduled field applications of the Saturn turbine include: Power source for 750 kw electric generator sets in process plants, portable field equipment, pipeline pumping, and gas compression in the petro-chemical industry. Other uses are as a power source for a 600 kw generator set in a commercial marine installation, propulsion units for marine and amphibious vehicles, and prime movers for off-highway vehicles.

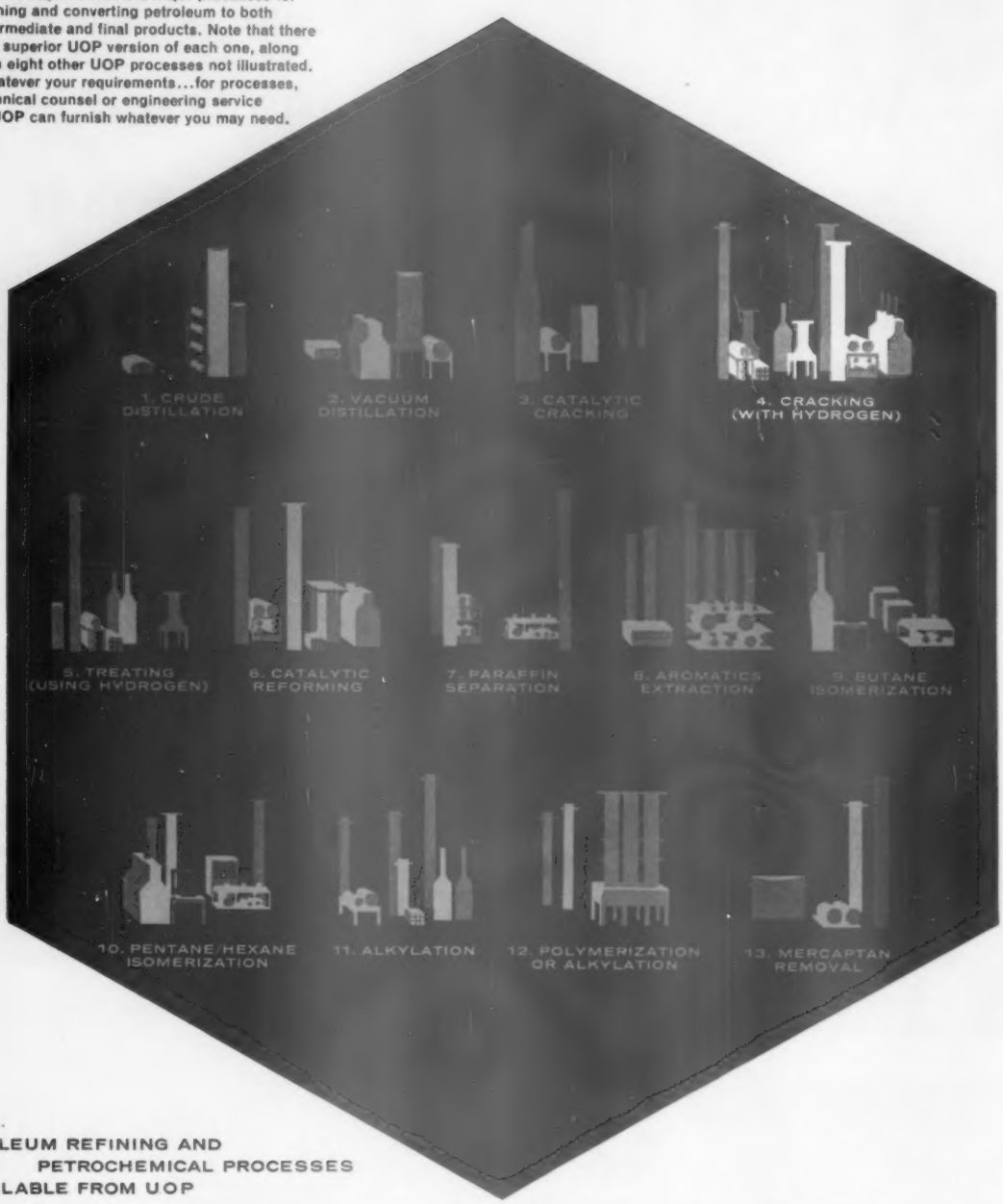
Detailed data on Solar gas turbines and other turbomachinery is available. Write Dept. H-174, Solar Aircraft Company, San Diego 12, California.



Saturn T-1000 dimensions

SOLAR
AIRCRAFT COMPANY
A subsidiary of International Harvester Company

Here are symbolized the major processes for refining and converting petroleum to both intermediate and final products. Note that there is a superior UOP version of each one, along with eight other UOP processes not illustrated. Whatever your requirements...for processes, technical counsel or engineering service ...UOP can furnish whatever you may need.



PETROLEUM REFINING AND PETROCHEMICAL PROCESSES AVAILABLE FROM UOP

1. CRUDE DISTILLATION equipment is designed and engineered by UOP in any desired capacity.

2. VACUUM DISTILLATION and **VISBREAKING**—easy-to-operate processes for preparation of feed stocks for catalytic cracking.

3. FLUID CATALYTIC CRACKING—an improved process that gives higher yields, higher octane numbers.

4. LOMAX™—highly flexible process that converts middle distillates and vacuum gas oils into gasolines and distillate fuels of outstanding quality.

5. UNIFINING™—a modern process that completely purifies petroleum distillates.

6. PLATFORMING® produces high octane gasolines, high purity aromatics.

7. MOLEX™—a new continuous separating process that removes lowest-grade hydrocarbons from gasoline.

8. UDEX®—the ideal process for separation of super-purity aromatics.

9. BUTAMER™—a new and practical process for producing isobutane.

10. PENEX®—a new process that converts light, normal paraffins to isoparaffins.

11. HF ALKYLATION—makes alkylate, top anti-rumble motor fuel. Sulfuric acid process also available.

12. CATALYTIC CONDENSATION—converts olefin fractions of refinery gases into high-quality gasoline and petrochemicals.

13. MEROX™—a new and inexpensive treating process to remove mercaptans from gasolines and light distillates.

PROCESSES NOT ILLUSTRATED:

REXFORMING®—the ideal process to insure your top octane position.

CATALYTIC DEHYDROGENATION—removes hydrogen from hydrocarbons to produce less-saturated hydrocarbons.

HYDEAL™—a new process for the hydrodealkylation of toluene or C_9 aromatics to produce benzene; may also be used for manufacturing phenol and naphthalene.

HYDRAR™—converts benzene to cyclohexane with excellent yields, achieves extreme high purity with Udex grade benzene.

OLEFIN EXTRACTION—efficiently separates olefins and diolefins from paraffins; prepares olefins for further conversion.

AROSORB™—removes heavier aromatics from synthetic and natural distillates, produces aromatic-free heavier distillates.

ALKAR™—produces ethylbenzene, cumene and other alkylated aromatics from Fluid Cat Cracker off-gas streams.

UNISOL®—an economical process for treating high mercaptan-containing gasolines.

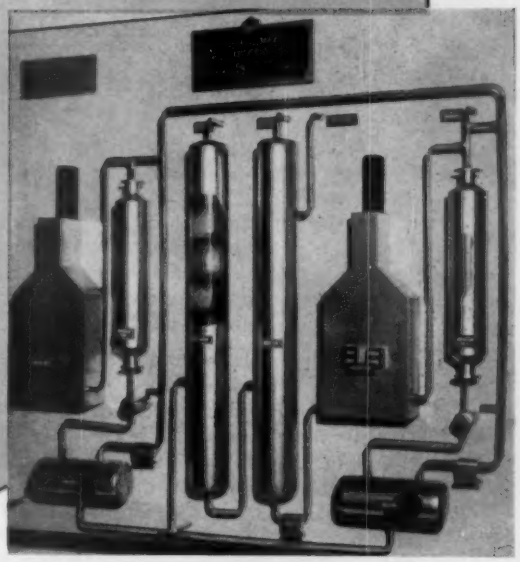
'62 COULD BE THE YEAR FOR YOU!

how to make products your customers want to buy...

Described below is the new and versatile UOP process . . . LOMAX. A remarkable and ultra-flexible cracking-with-hydrogen process, LOMAX enables the refiner to reach a new high in operating flexibility. He can convert his middle distillates into the most *immediately saleable* ratio of gasoline and distillate fuels . . . and change his ratio to fit the changing needs of his market.

With UOP processes the refiner can accomplish just about anything that comes within the realm of practical petroleum refining technology. Take a look at the brief descriptions on the opposite page, and you'll agree. And remember, in many cases existing equipment can be revamped and expanded, and thereby will produce more saleable products.

*INFORMED OPINION indicates that 1962 will require a substantial increase in process capacity ...NOW is the time to start your planning! Ask us about a preliminary proposal...no obligation!



LOMAX™ With this new and highly flexible UOP process, model of which is shown above, the refiner is able to increase production of his most currently saleable product on a year-'round basis. Through the catalyzed reaction of oil with hydrogen, LOMAX converts middle distillates ranging from kerosines to heavy gas oils into a wide ratio of gasoline or distillate fuels.

As seasonal demands change, LOMAX production of these products is adjusted accordingly.

Important additional benefits afforded by LOMAX include distillates of exceptionally high purity (even from sour crudes) . . . predominance of branched isomers in light hydrocarbons . . . greatly reduced quantities of light gases . . . olefin-free products . . . long catalyst life . . . and other advantages.

LOMAX may be used to supplement existing facilities, or as a basic cracking operation in a new installation.

UOP

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U.S.A.

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

Sheffield's Alloy Steel Center Helps Put This

Tough Customer in the Sky

tough alloy steel from Sheffield in many parts

Here you see the A4D-2N Skyhawk, versatile attack bomber of the U. S. Navy and Marine Corps. Though America's smallest and lightest jet combat airplane, the Skyhawk packs a heavyweight punch — can even carry guided missiles and nuclear bombs.

Built for action, speed and durability, the Skyhawk has stamina in every part. And many of these parts are fashioned from 4130 Aircraft Quality Plate—a product of Sheffield's Houston plant, the alloy steel making center for the Gulf, Southwest and West. Quantities of this same plate also take to the air with the B-47 bomber. Other Sheffield alloys are part and parcel of the Redstone and Nike missiles.

Fine constructional alloy steels are a specialty of the Houston plant. Alloying elements range through the chemical alphabet from Aluminum to Zirconium. Whatever the need for strength, hardness, toughness, machinability or whatever type of heat treating is required, the Houston plant can meet it.

And industry is making wide use of this skill. Sheffield's Houston plant has become the most diversified steel producing center west of the Mississippi. Sheffield's alloy specialists stand ready to help work out the solution to your constructional problems.

SHEFFIELD

ARMCO

Heat Treated Carbon and Alloy Steels

SHEFFIELD DIVISION

Sheffield Plants in Kansas City, Tulsa and Houston

ARMCO

ARMCO STEEL CORPORATION

OTHER DIVISIONS AND SUBSIDIARIES: Armco Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

"WE KEEP OUR CARDWELL RIGS BUSY ON CONTRACTS WE COULDN'T GET WITHOUT THEM!"

"In the past, there were times when we found ourselves with the wrong rig for the work that was available. I can happily say that this situation rarely exists any more," says Mr. Hegwer. "With our Cardwell KM250 and KM210 rigs we can handle most any job inside the 15,000-foot range. We can perform more jobs faster, at less cost to us and the operator. Drilling, Servicing, Completion, Workover—it makes little difference! We drive in anywhere with these rigs, get on and off the well in less time than other units. We have plenty of power and can keep up with any rig on shallower drilling. We cut down trip time, too! This is extremely important to being competitive on workover, servicing, and completion work. Low maintenance costs allow us to keep day rates to a minimum. Both rigs are flexible, convenient for the driller and roughnecks alike. The hands really take care of the rigs because they're proud of them. And, so are we!"

Like Mr. Hegwer, you will find that Cardwell KM250 and KM210 rigs allow you to be competitive and still make a profit. Contact a Cardwell representative to find out just how profitable they can be.

for tomorrow's equipment—see Cardwell today!

cardwell MANUFACTURING COMPANY, INC.

Box 2001, Wichita, Kansas • Cable: ALLSTEEL • Phone: AMherst 7-3311

Foreign Manufacturing Licensees: LE GRAND ROCHESTER LTD., London S.E. 7, England; TRAUZL-WERKE, A.G. Vienna 21, Austria

IN A FIVE-MINUTE TELEPHONE CONVERSATION . . .

This gas processing specialist helped an operator save $3,000 a day

Recently, a West Texas natural gas processor called stating he was flaring sales gas due to high sulfur content caused by foaming in an ethanolamine system. The same antifoamants used successfully for some time were not effective. Subsequent questioning revealed that his gas stream was now at a higher temperature than the amine and a condensation of hydrocarbons resulted. On-the-phone-solution . . . raise the amine temperature to approximately 15° F. above that of the gas stream.

This, of course, was a simple one. More often Jefferson's experienced gas treating specialists will probe for pertinent data, request samples, and coordinate the solution of your problem through Jefferson's Austin Laboratories. Whether your problems be in desulfurization or dehydration . . . corrosion, foaming or contamination . . . Jefferson can draw on a vast fund of case experiences to help you avoid costly shutdowns, gas flaring or excessive solution losses.

For the *right* gas processing answers and chemicals . . . call Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

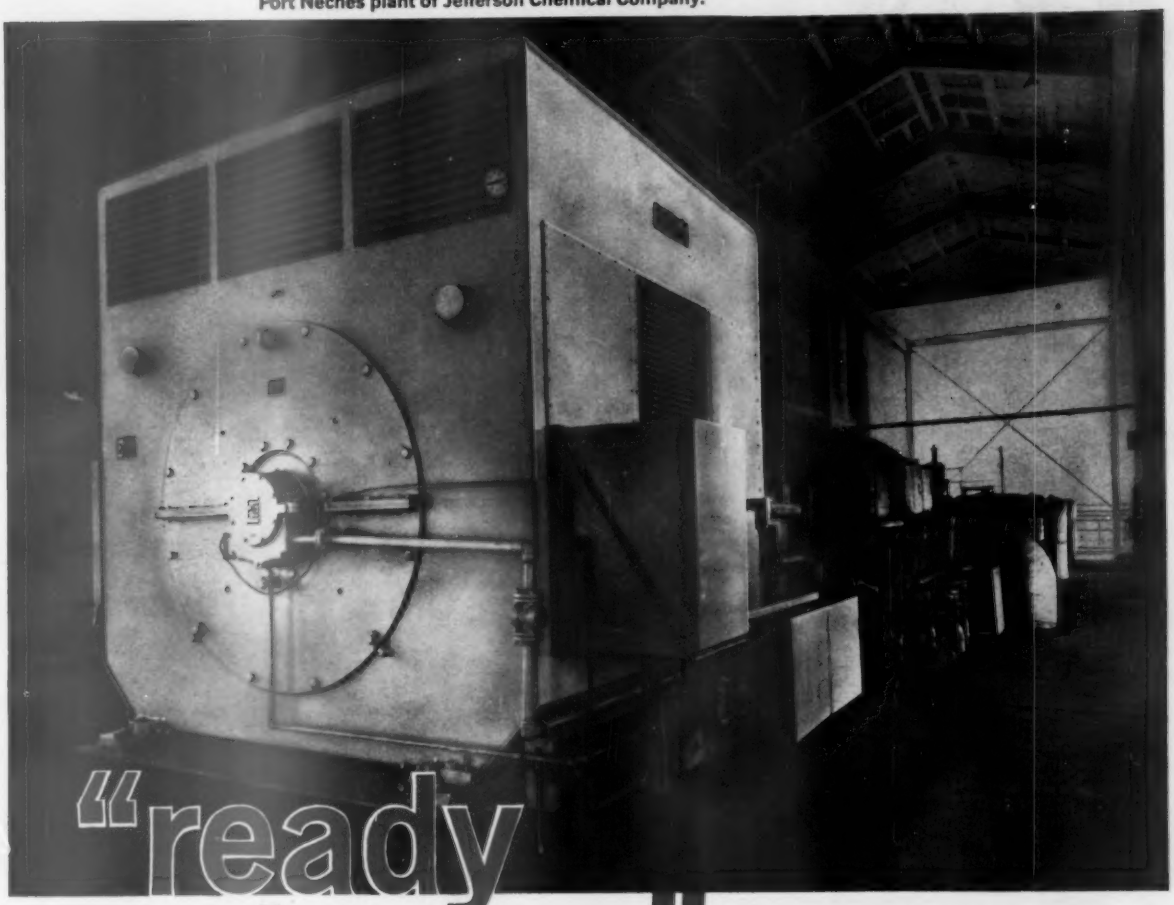
Ethylene and Propylene Oxides, Glycols, Dichlorides, Carbonates
SURFONIC® Surface-Active Agents • Ethanolamines • Morpholine
N-Alkyl Morpholines • Polyethylene and Polypropylene Glycols
Piperazine • Piperazine Salts • Nonyl Phenol • Caustic Soda

HOUSTON • NEW YORK • CHICAGO • CLEVELAND • CHARLOTTE • LOS ANGELES

JEFFERSON CHEMICALS

012

VERY PLEASED were user and contractor with the ease of installation and start-up of "Big Bertha," the 7000-hp Elliott motor shown below. It drives a compressor in the Port Neches plant of Jefferson Chemical Company.



"ready to run" when delivered

means easy, quick, economical installation

Elliott eliminates large motor "bugs" at the factory

A fundamental feature of Elliott motor manufacturing is to make certain that all motors are "clean" when shipped. Careful checks, tests and adjustments at the factory eliminate potential trouble-making "bugs" before shipment, making installation, start-up and early operation smooth and easy.

A good example is the 7000-hp Elliott motor shown above, dubbed "Big Bertha" by the operators. It went into operation very, very smoothly, which pleased both contractor and customer. And this is not an isolated case; the Elliott reputation for clean, bug-free motors is very well established. "You can bolt them down and start them up" is what our customers say of Elliott large motors.

Of course, "cleanliness" is only one manifestation of the high quality and perfection of every detail that is characteristic of all Elliott large motors. An interesting sidelight on this particular installation is that the motor was found to be carrying a load considerably in excess of guaranteed rating, without the slightest sign of distress

It is no wonder that experienced users say that the *very finest large motors built are built by Elliott.*

ELLIOTT Company
Ridgway Plant, Ridgway, Pa.

RO-3

GOODALL HOSE

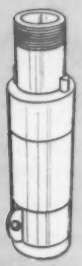
Is better than good...

IT'S THE FINEST ROTARY HOSE MADE

Goodall Rotary Hose is the finest hose made—a strong statement, but one that is proven day after day, year after year.

Because Goodall is *the top quality rotary hose* you receive a one-year warranty with each Goodall hose you buy. A warranty that contains no limits on working pressures. Only the finest hose made—only Goodall with its high burst pressure built into the hose—could make this guarantee. Why not make your next rotary hose Goodall; you get greater value for each dollar spent when you do.

These exclusive features are available *only* with Goodall Long-Life Rotary Hose:



The Barney Coupling

The Goodall Safety Clamp

The Goodall Repair Service

The Goodall One-Year Guarantee

GOODALL RUBBER COMPANY

TRENTON, N. J.

Goodall Rubber Company of Texas: Houston and Odessa.

Goodall Rubber Company: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit, San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.

Export: Goodall Rubber Company, Trenton, New Jersey.

Stocking Distributors: Texas and Louisiana—Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Co., Superior Iron Works & Supply Co., Inc., Heap Equipment Company, Iverson Supply Co.

Available through all qualified supply stores.

The OIL AND GAS JOURNAL

TULSA OFFICE
211 South Cheyenne Avenue
Box 1260
Phone LUther 4-4411

George H. Weber ..... Editor
Henry D. Ralph ... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ... Engineering Editor
Frank J. Gardner ... Exploration Editor
Paul Reed ..... Pipeline Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ... Presentation Editor
John C. Casper ..... Economics Editor
W. B. Bleakley ..... Production Editor
Neil Williams ..... Associate Editor
Peter B. Bike ..... Geophysical Editor
H. S. Pylant, Petrochem. & Gas-Process. Editor
John P. O'Donnell ... Asst. Pipeline Editor
R. B. Tuttle ..... Equipment Editor

C. Dudley Johnston ..... Art Director
Robert B. Bizal ..... Editorial Research
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
Merle F. Blakely ..... District Editor
Sara Duncan ..... District Editor
Kenneth W. Brooks ..... District Editor
Norman K. Baxter ..... District Editor
Max L. Batchelder ... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
Margaret Higgs ..... Editorial Assistant
Marilyn Chance ..... Editorial Assistant
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

D. H. Stormont ..... Refining Editor
Paul Swain ..... International Editor
Gene T. Kinney ..... East Coast Editor
Ray G. Gibson ..... District Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ..... Drilling Editor
Howard M. Wilson ..... District Editor
H. C. Bozeman Gulf Coast Refining Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-5701

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

Carl J. Lawrence .... West Coast Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Clyde La Motte .... Washington Editor

BUSINESS STAFF

P. C. Lavinger ..... President

S. H. Rourke .. Executive Vice President
Mitchell Tucker .. Vice Pres. and Adv. Mgr.
Kenneth B. Barnes .... Vice Pres., Eastern Hemisphere Operations
Hanson B. Pigman .. Vice Pres., Circulation
L. John Ford ..... Mgr. Industry Census
J. Parker Holland .. Production Manager

ADVERTISING STAFF

TULSA OFFICE
211 South Cheyenne Avenue
Phone LUther 4-4411

John D. Reilly .. Mid-Continent Manager
Roy E. Finley ..... District Manager
Philip C. Lavinger, Jr. .... Representative
D. B. Miller ..... Classified Adv. Mgr.

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

E. S. Klappenbach .... Eastern Manager
Harry B. Bullen ..... District Manager

PHILADELPHIA OFFICE
1509 Land Title Building
Broad and Chestnut Streets
LOcust 3-0118

John W. Meany, Jr. .... District Manager

PITTSBURGH OFFICE
Law & Finance Building, 429 Fourth Ave.
Room 1505, GRant 1-5847

Ernest S. Holzworth .... District Manager

DETROIT OFFICE
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455

John D. Yoder ..... District Manager

LOS ANGELES OFFICE
650 South Grand Avenue, MAdison 2-0722

George O. Ruppert .... District Manager

CHICAGO OFFICE
105 West Madison Street
Phone CEntral 6-2537

David T. Kenney ..... District Manager
Karel Wegkamp ..... District Manager

HOUSTON OFFICE
802 American Investors Building
CApitol 4-7726

John M. Spears .... Gulf Coast Manager

DALLAS OFFICE
1238 Mercantile Building
Riverside 8-5701

Pren G. Hollingsworth .. District Manager

ENGLAND
67/68 Jermyn Street, St. James,
London S.W. 1. Phone TRAfalgar 6318

Max Holsinger .... Director International Sales Operations
A. T. Chapman-Purchas .. Group Manager

GERMANY
29 Hunsrücken Strasse,
Düsseldorf (Altstadt)
Phone 1-49-04

FRANCE
6, rue Franklin Roosevelt, Paris 8e
c/o Soc. D'Etudes Petrolieres, 3 Etage
Phone, MALzac 66-70

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00.

Member
Audit Bureau of Circulations
Associated Business Publications

They Say—

Fast drilling a delight

Dear Sir:

Your photographic story of Gulf's fast drilling has such excellent photographs and is so interestingly set out, I would like to offer both my congratulations and our delight.

A. F. Lorton, Jr.
Public Relations Dept.
Gulf Oil Corp.

Silence can be damaging

"The oil industry badly needs spokesmen who know what they're talking about and have the courage to speak up, especially when it comes to explaining gasoline prices and taxes.

"Time after time, in state after state," we have remained silent while people with axes to grind have criticized pricing policies to the extent that some legislators have even threatened utility controls.

"We must speak up for ourselves. When people start talking about high prices, let's tell them what a bargain gasoline is. Since the early days of the automobile era—40 years ago—gasoline prices have actually declined 30% while taxes have gone up 100-fold.

"As you and I know, the average ex-tax price at the pump today is lower than it has been since 1953. 'Gasoline's a buy, only the tax is high' is more than a slogan: It's the gospel. truth."

L. W. Moore, president, American Oil Co. Before meeting of New York State Jobbers.

All is not well

"The possibility of the restriction of imports of Venezuelan oil into the Ontario market, either in crude or refined form, should be followed with great interest by Canadians.

"But Canadians must not allow the announcement by the Venezuelan embassy in Ottawa to lull them into some sort of feeling that all is at last well with the oil world.

"Canada is Venezuela's second biggest market for oil. By indirection, the embassy spokesman made it clear that Venezuela is aware that there is growing support in Canada for government import restrictions. He hinted that the Canadian Government approves of Venezuela's move. . . .

"There is something strangely un-

POWER LINE TO PROFIT

Halliburton Power-Driven Measuring Equipment Means More Accurate Downhole Determination!

The Halliburton Measuring Device, first developed over 35 years ago, provided the Industry with a means to accurately measure the top of the cementing plug being pumped to the bottom of a string of casing. This assured a placement of cement slurry outside the casing and around the shoe joint.

Today, Halliburton offers a complete line of Power-Driven Measuring Assemblies . . . still pointing the way to increased efficiency on your job and more profit in your well operation.

Popular applications of this advanced Halliburton equipment are:

- Accurate measurements of depths in wells.
- Running crooked hole survey instruments.
- Running instruments to obtain bottom hole pressures and temperatures, fluid samples, etc.
- Running mechanically operated paraffin cutting tools.
- Running Halliburton Limit Plugs, or other types of tools in casing or in open hole.
- Running shifting tools through tubing in changing chokes and seating nipples.

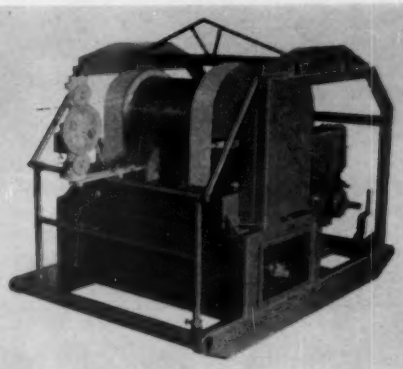
HALLIBURTON
MEASURING EQUIPMENT

"A Measure of Accuracy - - - for All Downhole Requirements"

PICK YOUR POWER...

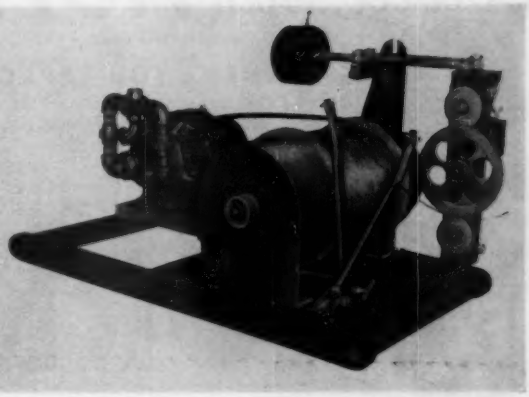
DIESEL

This diesel-engine-driven Super Duty Measuring Assembly is designed for the toughest and most severe types of wire line operations. It is a completely packaged unit including power, three-speed transmission, reel assembly, controls, measuring device and wire line. The convenient center-lift point and rigid guard rails are ideal features for work on offshore platforms or for heavy duty wire line service anywhere. The line capacity of reel ranges from 3000′ of 5/16″ cable to 43,600′ of .082″ diam. steel wire line.



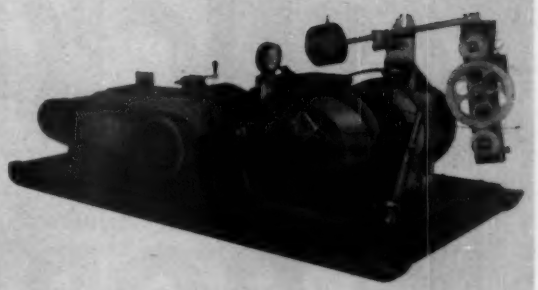
AIR

With the increasing use of pneumatic controls and drives for drilling equipment, many operators are finding it convenient to drive their Halliburton Measuring Line Equipment with air motors... especially where safety practices rule out diesel or electric power. Most Halliburton Standard Measuring Reels are suitable for mounting and driving with this radial 5 cylinder air motor. The line capacity of the Heavy Duty Reel ordinarily preferred ranges from 10,000′ of .092″ to 18,000′ of .066″ diam. steel wire line.



ELECTRIC

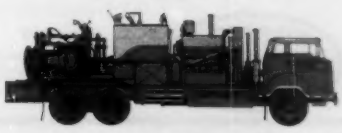
This Extra Heavy Duty Type Electric Measuring Assembly is designed for use where dependable electric AC power is available. The compact unit is equipped with a three-speed transmission, a 5 hp variable-speed electric motor, Extra Heavy Duty Reel, measuring device and measuring line. The motor controls are conveniently located and all wiring is installed in accordance with the latest codes and specifications. The line capacity of this assembly depends upon type of reel selected which may range from 3000′ of cable to 67,500′ of .066″ diam. steel wire line.



Replacement Parts . . . are available in most Halliburton warehouses for Standard Measuring Devices, Reel Assemblies and Accessory Equipment. Measuring Lines of standard diameters and types are stocked everywhere Halliburton Cementing Trucks are stationed.

MEASURING EQUIPMENT

275 service centers... just minutes away from your well



Halliburton
COMPANY · DUNCAN, OKLAHOMA

real about the things which have been said, and which have been left unsaid, by the Canadian and Venezuelan governments. Something is missing.

"It is the presence and action of the international oil companies, which sit silently by, watching as governments jockey for position, when they have it in their power to sensibly and quickly resolve the issue.

"The issue is the fact that Canada's oil industry produces at less than half of capacity, while its richest market is served from abroad. . . .

"Is the only answer the invocation of import regulations by the Canadian Government? The Government of Venezuela seems afraid that this is so. The international companies still sit silent. Why?"

Editorial in the Calgary Herald.

Intra-industry peace first

"In spite of all the money which the industry has spent—and all the work we have done over the last several years to improve our public relations, we must admit that at best, they are not what they ought to be.

"Maybe, we should be honest and admit they are bad . . . I think the basic cause of our bad public relations is bad intra-industry relations. Producers have not been concerned with problems of marketing, refining, or transportation.

"Production people have said: 'We in production make the money, you in sales lose it.' Suppliers claim jobbers make too much money, are uncooperative. Dealers contend that suppliers are not sympathetic with their problems.

"To boil it all down, there simply has not been any cooperation within the industry concerning mutual problems.

"As I see it, we need to improve our intra-industry relations. I believe there is a genuine concern within the industry about our public relations. This is most encouraging.

"If we determine within the industry to solve our problems WITHIN the industry, then we automatically will improve our public relations. If we wind up going to the Government, we will find we have more problems than we started with—certainly, going to the Government is not going to improve our public relations one iota."

E. K. Bennett, president, National Oil Jobbers Council. Before New Mexico Petroleum Industries Committee.

Optimism in Canada

"In Canada, we have a most interesting period ahead of us for the oil industry. A forecast of the future reveals far more optimism than current national discussion would suggest.

"There are now 2 million oil-heated homes in Canada, compared with less than half a million in 1946. Canadians now drive nearly 4 million cars, compared with just over 1 million in 1946.

"Many manufacturing concerns have been attracted to the western provinces to meet the complex requirements of exploration, drilling, and production programs. The provinces boast a major petrochemical industry. There are now 750,000 more people living in Canada's western provinces than there would have been without the coming of the oil industry.

"We in Canada are a decade or more behind the United States in use of natural gas for residential and industrial purposes. At present, natural gas accounts for little more than 10% of our total national fuel consumption. Its share of the total energy market is bound to grow and have an impact on the growth rate of oil.

"We can reasonably expect the total demand for petroleum products to reach 1.4 million barrels per day by 1970—or nearly 600,000 bbl. per day more than demand last year."

A. C. Ashforth, president, Toronto-

Service with ACTION

WHEN YOU SPECIFY-

W.C. NORRIS SUCKER RODS

Write for complete Sucker Rod Bulletin

W. C. NORRIS, MANUFACTURER
DIVISION OF DOVER CORPORATION
P. O. BOX 1739 • TULSA, OKLAHOMA
BRANCHES: Great Bend, Kansas; Corpus Christi, Houston, Kilgore, Odessa, Wichita Falls, Texas; Oklahoma City, Oklahoma; Salem, Illinois; Casper, Wyoming; Farmington, New Mexico; Edmonton, Alberta, Canada.

NORRIS QUALITY
SUCKER RODS
POLISHED RODS . COUPLINGS

Buy From Your NORRIS Distributor

CONTACTOR NUMBER 5

AMINE PROCESS DESIGN AND OPERATING INFORMATION

While ethanolamines are an excellent medium for treating gas, their satisfactory application depends on proper use of the amines and correct design of mechanical equipment. Some of these important design and operating considerations are discussed in this series.

Removing Suspended Solids in Treating Systems

Sludge that is commonly found in amine units is typically more noble than mild steel. Its deposition on steel surfaces in static or low velocity sections of amine units can result in galvanic-cell type corrosion.

In units that accumulate large volumes of sludge, the possibility of entrainment of iron sulfide and siliceous materials from the producing formations should be investigated. Proper separation equipment should be installed ahead of the amine contactor where such carry-over is occurring.

To remove suspended solids, a precoat filter of adequate cake capacity should be installed. *Rate* and *location* of filters are both important factors in the effectiveness of filter units. They should not pass particles larger than 5 microns, and rates should be such that suspended solids do not accumulate in the amine solution. The following locations are the most likely trouble spots:

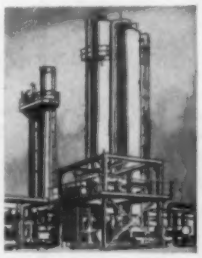
1. Exit from the absorber.

2. Rich amine inlet to the hottest heat exchanger.

3. Rich amine exit from the hottest heat exchanger (inlet to the reactivator).

4. Exit from reactivator (lean amine inlet to hottest heat exchanger).

5. Lean amine exit from hottest heat exchanger.



In general, deposit of solids appears to occur to the greatest extent on the shell side of exchangers or in reactivators. Since the rich amine is usually on the shell side, locations 2 or 3 may be preferred. In general, positions 2 through 5 permit a single location of the filter with minor piping changes permitting operation on any of these streams. Initial operations should be on a stream just ahead of the point of greatest solids deposition.

Preventing MEA Losses

Properly designed ethanolamine treating plants can be operated with a minimum of chemical loss. For example, this is proved by plants operating in the range of .25 to .5-lb. of MEA/MMCF of gas processed. In such plants, much stress is given to the prevention of spill losses, pump-seal or packing leaks and solution waste. The amount of amine solution loss that can be attributed to these causes is surprising.

Entrainment represents a dead loss which can be corrected by properly designed mist extractors. MEA and DEA are known to foam under certain conditions, and for this reason can form fogs with particles in the range of 0.5 to 20 microns in size. Equipment is now available for separating particles of this size and can be employed to stop contactor carry-over. Mist extractors are not too important on the still overhead, since the carry-over is caught in the reflux accumulator.

Just as cleanliness usually indicates a well operated plant, a clean solution normally indicates low amine losses. This is a good analogy since foaming and excessive corrosion go hand in hand with dirty solutions.

Prevention of Foaming

Foaming can be a troublesome source of amine losses and reduced capacity. Some cases are: finely divided suspended solids; organic acids in the gas stream; degradation products and dissolved hydrocarbons.

Foaming due to suspended solids is best controlled as described above. Organic acids and degradation products are best removed by use of an adequate reclaimer (vacuum units should be considered for diethanolamine units).

In some cases, activated charcoal filters have been used to remove hydrocarbons and other foam producing contaminants. Foam inhibitors should be used to relieve foaming temporarily. *GE Antifoam 60* is a very effective inhibitor. *Ocenol* has also been used in many cases.

Treated Water Is Essential

Amine solution should be made up with deionized water *only*. In most cases, steam condensate is available and should be used. Introduction of foreign ions, particularly chloride, can contribute to corrosion.

FOR MORE INFORMATION, on gas treatment, look for the next Allied Chemical Contactor.

For specifications and local offices, see our insert in Chemical Materials Catalog, pages 475-482 and in Chemical Week Buyers Guide, pages 37-44.

BASIC TO AMERICA'S PROGRESS

2019

Allied Chemical

NITROGEN DIVISION

Dept. CS-55-2, 40 Rector Street • New York 6, New York

a winch so unusual

we don't know how many uses it has!

here's how it looks inside

here's how it looks on a truck

BRADEN CL WINCH

This BRADEN CL Winch was designed primarily for utilities. It will draw wire or cable at a CONSTANT SPEED until the winch drum is completely filled! *This has not been possible before.*

We believe there are many uses for the new CL Winch. Maybe it will help solve a winching problem for you where CONSTANT SPEED is desirable. Write for complete information on this unusual CL Winch, or let us know if you would like for a representative to call on you. We believe we've really got something.

BRADEN WINCH DIVISION OF MOTOR PRODUCTS CORPORATION

P. O. BOX 547 • BROKEN ARROW, OKLAHOMA

"In Service Around the World"

Dominion Bank of Toronto. Before American Petroleum Credit Association.

What it means

"The expession 'Free Enterprise' means that our ability and individual initiative are the only limits to the height of our success. Free enterprise means that the rewards of our work and thrift belong to us—that our welfare depends primarily upon our ability, industry, and thrift.

"In short, 'Free Enterprise' means that we always have recognized that a nation's growth rests primarily on the foundation of individual freedom."

Article in the Esso News, magazine of Humble Oil & Refining Co.'s Baton Rouge refinery.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

NOVEMBER

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

14-16 Society of Petroleum Engineers of AIME, Venezuelan sections, fourth annual meeting, Maracaibo, Venezuela.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

15-16 Purdue University, symposium on engineering applications of random function theory and probability, West Lafayette, Ind.

15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubricants conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

18-20 Roswell, N. M., Geological Society, field trip, San Andres and North Franklin Mountains, registration November 17, Las Cruces, N. M.

20-22 Fluid Controls Institute, Inc., fall meeting, Drake Hotel, Chicago.

22 Manufacturing Chemists' Association, tenth semiannual meeting and midyear conference, Statler Hilton Hotel, New York City.

27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.

DECEMBER

1-3 American Chemical Society, southwest regional meeting, Biltmore Hotel, Oklahoma City.

4-7 American Institute of Chemical En-

gineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

9 Tulane University, School of Law, and American Association of Oilwell Drilling Contractors, fifth annual program on mineral and tidelands law, University Center, Tulane University, New Orleans.

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

MARCH

1 Institution of Mechanical Engineers (Great Britain), symposium on user experience of large-scale industrial vacuum plant, London.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

SENSITIVE SENTINEL

is a good description of the Barton 257 differential pressure indicating switch. Accurate, responsive, easy to read and infinitely dependable, the 257 is ideal for energizing alarm circuits when limits of flow, level, or differential pressure are exceeded. Like many Barton instruments, the 257 D.P. switch has as its heart the rupture-proof dual bellows Barton meter body—proved beyond doubt to be the finest in the field. For new standards of accuracy and dependability in your measurement and control instruments, look to the leader—buy BARTON®

BARTON INSTRUMENT CORPORATION • MONTEREY PARK, CALIFORNIA

no more knuckle-busting...
New RIDGID® 450
Portable Tristand Chain Vise

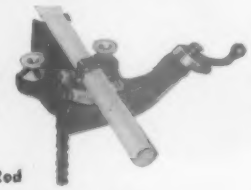
has Large, Easy-to-Operate Top Screw Handle right up on top!

Here's a real time saver. Not only do you get a complete workbench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

New RIDGID Bench Chain Vises have same Extra-Efficient Top-Screw Adjustment.

5 Sizes for ⅛" to 8" Pipe, Conduit or Rod

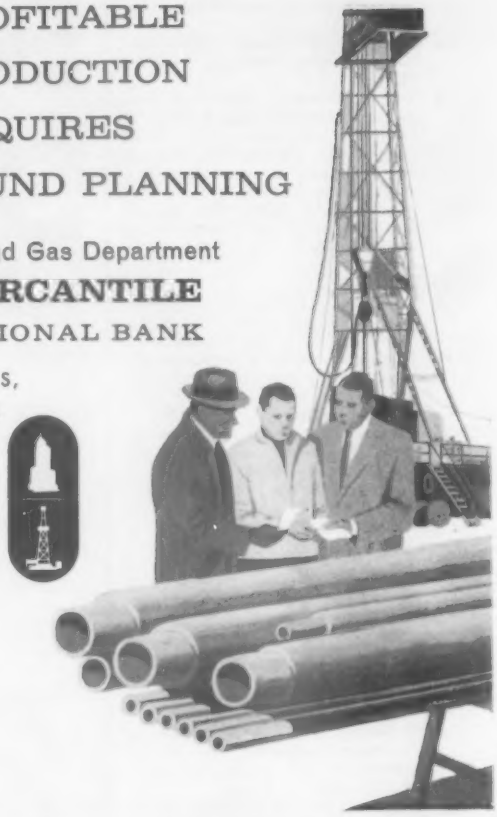


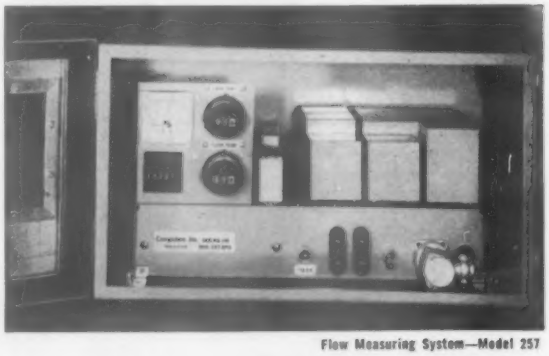
RIDGID

The Ridge Tool Company • Elyria, Ohio, U.S.A.

PROFITABLE PRODUCTION REQUIRES SOUND PLANNING

Oil and Gas Department
MERCANTILE
NATIONAL BANK
DALLAS, TEXAS





Flow Measuring System—Model 257

ACCURATE GAS FLOW MEASUREMENT WITH LOCAL OR REMOTE DIRECT READOUT

- Fast response
- High accuracy
- Plug-in components for easy maintenance
- A.C. or D.C. models available
- Integrated volume in cubic feet
- Instrumented for use with single orifice plate or multiple meter runs
- Flow rate indication

To learn more about modern gas flow measurement for automatic well testing, gas lift, sales and purchase, contact

COMPUTERS, INCORPORATED
3407 South Shepherd Drive • Houston 6, Texas

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

9-12 Western Petroleum Refiners Association, annual meeting, San Antonio, Tex.

9-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

19-21 National Petroleum Association, semi-annual meeting, Hotel Cleveland, Cleveland.

20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.

24-26 Southern Gas Association, meeting, New Orleans.

24-27 American Association of Petroleum Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting, Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

MAY

3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone-Henning Hotel, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

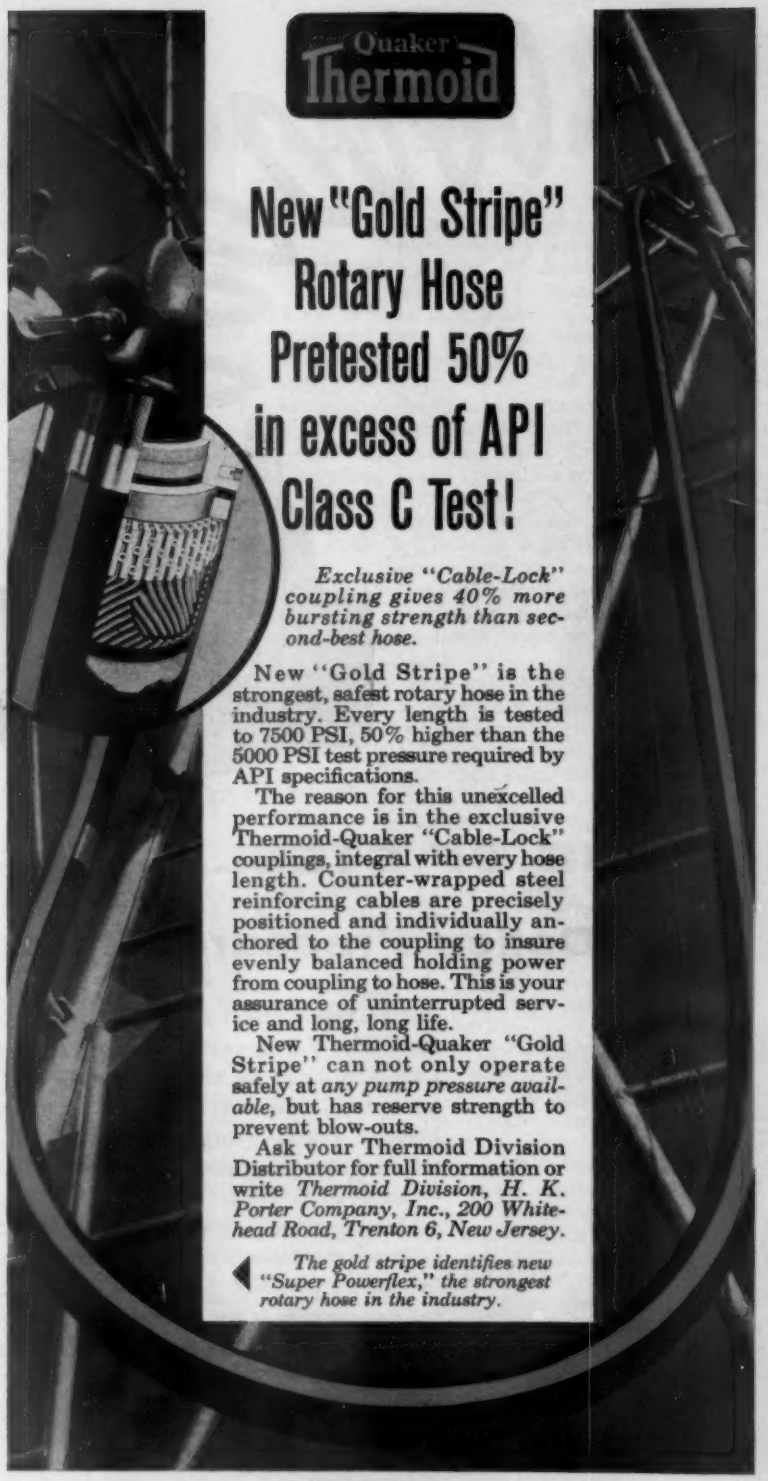
4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

7-10 American Institute of Chemical Engineers, meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

9-11 Western Joint Computer Conference and Exhibit, Ambassador Hotel, Los Angeles.

10-12 American Society of Mechanical Engineers, production engineering conference, Royal York Hotel, Toronto.


Quaker
Thermoid
New "Gold Stripe" Rotary Hose Pretested 50% in excess of API Class C Test!
Exclusive "Cable-Lock" coupling gives 40% more bursting strength than second-best hose.
New "Gold Stripe" is the strongest, safest rotary hose in the industry. Every length is tested to 7500 PSI, 50% higher than the 5000 PSI test pressure required by API specifications.
The reason for this unexcelled performance is in the exclusive Thermoid-Quaker "Cable-Lock" couplings, integral with every hose length. Counter-wrapped steel reinforcing cables are precisely positioned and individually anchored to the coupling to insure evenly balanced holding power from coupling to hose. This is your assurance of uninterrupted service and long, long life.
New Thermoid-Quaker "Gold Stripe" can not only operate safely at any pump pressure available, but has reserve strength to prevent blow-outs.
Ask your Thermoid Division Distributor for full information or write Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.
The gold stripe identifies new "Super Powerflex," the strongest rotary hose in the industry.

THERMOID PORTER DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

RING OF STEEL

Defies Pressure Times Ten

The Flexitallic gasket in the bonnet joint of Hancock Steel Gate Valves cannot blow out even if pressures exceed ten times the rating of the valve. Valve maintenance and equipment down-time are greatly reduced. Made of a spiral-wound ribbon of stainless steel with asbestos filler, the gasket has spring-like compressibility — cannot be flattened.

Only the specially-designed Hancock bonnet joint with built-in compression limit can make full use of the positive sealing power of this ring of steel. Such advanced valve engineering is one example of total Hancock quality that assures trouble-free performance. Your nearby industrial supply distributor will gladly explain every economy feature of Hancock Steel Gate Valves. Phone him today.

Hancock 800# Steel Gate Valve, Type 950. Sizes: ¼" thru 2".

MAXWELL MANNING & MOORE INC. M&M TRADE MARK

HANCOCK STEEL VALVES

A product of

MANNING, MAXWELL & MOORE, INC.

Valve Division • Watertown, Massachusetts

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

the Journal said...

50 years ago

November 10, 1910

Standard Oil Co. (La.) enters Caddo play in northwestern Louisiana with purchase of J. C. Trees Oil Co.'s holdings for reported price of $9,000,000. Purchase covers more than 100,000 acres in general area with 7,000 acres proved by 25 wells and daily production of 8,000 bbl. Fifteen wells are drilling on the property.

Gulf Refining Co. is awarded lease to bed of Ferry Lake covering more than 8,000 acres in booming Caddo field. Lease bid totals $100,000, payable $30,000 in cash and $70,000 in deferred payments out of oil produced. Minimum of five wells obligated.

Producers Oil Co. (Texaco) enters Tampico boom with purchase of Mexico Fuel Oil Co.'s holdings on Panuco River, west of Tampico, totaling 10,000 acres with two producing wells.

25 years ago

November 7, 1935

New Monument area in Lea County, southeastern New Mexico, looms as major field. Development since discovery by Amerada Petroleum Corp. outlines productive area more than 6 miles long and 4 miles wide.

Natural Gasoline Corp., Warren Petroleum Co. subsidiary, breaks ground for 40,000 gal. natural-gasoline plant in Lea County, New Mexico. New plant will be largest of its kind in state with gathering lines serving producing area of 48 sq. miles and 150 to 200 wells.

Michigan's oil production climbs to new record-high level of 54,300 bbl. daily. October production sets new monthly record of 1,684,000 bbl.

10 years ago

November 9, 1950

Final weld made on Pacific Gas Co.'s "Super-Inch" gas pipe line from California-Arizona line to San Francisco Bay area. At state line border, new 506-mile, 34-in. line ties into El Paso Natural Gas Co.'s 1,050-mile trunk system delivering gas from West Texas and Texas Panhandle fields. El Paso Natural also completing 24-in. feeder system from San Juan basin area of northwestern New Mexico.

Sunray Oil Corp. sets new world's record for continuous operation of fluid catalytic gasoline cracking unit at its Duncan, Okla., refinery. Unit goes 611 days without shutdown—1 day longer than previous record held by Tidewater Associated Oil Co. since 1948 at its Avon, Calif., plant.

JOURNALLY SPEAKING

Smog for Mr. K

THE RUSSIANS make everything seem so simple.

When Premier Khrushchev was arriving in New York for his one-man show before the United Nations he made an offhand crack about fuel policy which shows how little he understands American bureaucracy.

The incident also suggests some of the troubles that European countries may get into if they permit political pressure to intervene in the competition between coal and oil in their markets.

As Mr. K's ship was steaming into New York harbor it passed a big electric-generating station that was pouring out clouds of black smoke. It was a rainy day, and the smoke drifted along with the fog to form what is popularly—or unpopularly—known as smog. It was a dismal sight, no doubt about it.

Whereupon the Boss of all the Russians turned to U. S. officials who had boarded at Quarantine and remarked in a superior manner that the Soviets have got rid of their smog problem by generating power with gas instead of coal.

Comrade Krush didn't know the half of it. The smog he saw was nothing compared to the bureaucratic smog behind it.

It's a long, sad story, but it has a moral.

Consolidated Edison Co. has 12 generating plants in New York City. Some burn coal, some oil, some gas. The coal plants smoke, and the company doesn't like that any more than its neighbors do.

So ConEd contracted to buy a big supply of natural gas at a fairly stiff price and arranged to have it piped into its plants to displace coal. It was a bright picture, but then the political smog began to cloud it.

The coal industry complained that this was a low blow, unfair competition, wasteful, uneconomic, antisocial, and several other things. It claimed that the coal miners needed the business more than the gas producers.

Self-appointed champions of household gas users also opposed the ConEd deal. They said that ConEd was grabbing off such a big hunk of the available gas supply that maybe there wouldn't be enough left for plain, ordinary people to use for heating water and cooking. Also that the price Con Ed offered was high enough to give producers some fancy ideas and this might result in higher prices for other people's gas.

The argument all took place before the Federal Power Commission, which some people think is on the way to becoming the U. S. equivalent of the Soviet Commissar of Fuels. After long deliberation, FPC turned thumbs down on the deal. It followed what is known as a policy of end-use control. It said gas is too valuable for "inferior" uses like boiler fuel where coal would do and should be saved for future "superior" uses such as in homes.

The gas people said that if gas is so superior it ought to have a superior price and home owners should be willing to pay more for it than for other fuels. Also that if ConEd is willing to pay more for the gas than other people, it ought to be allowed to buy it. They appealed to the courts, and the matter has been tied up in litigation for some 3 years.

Meanwhile ConEd got tired of the whole thing and is putting in oil burners at considerable expense. So both coal and gas lose out.

Incidentally, nobody asked the residents of New York City to vote on whether they would rather have clean air for themselves now or gas saved for their grandchildren's cookstoves.

This is just a sample of the kind of bureaucratic bumbling that could become general if Congress should set up a "national fuels policy" along the lines advocated by the coal and some other people. This is a scheme to have the federal Government determine what fuels should go to what uses and at what prices. Other people think that the best fuels policy is to let consumers have a free choice and to let them bargain with the sellers as to the price.

We understand that some European countries are considering their own national fuels policies to regulate competition among coal, oil, and gas. After looking at New York's experience they might conclude that bureaucratic smog is worse than the physical kind.

—Henry D. Ralph

Baker Wire Line Pressure Setting Assembly, Product 437

Baker Wire Line Bridge Plug, Product 400-N

RUNNING MATES

A Baker Bridge Plug is tough and reliable. So is a Baker Wire Line Pressure Setting Assembly. They're running mates—a matched pair. They've been working together for years, building a reputation for dependability.

The average wells or the hot, high pressure wells—a Baker Bridge Plug masters them all. Whether you measure its life span in hours or in years, it's got what it takes to do its job.

Setting a plug on wire line today is a simple operation, and a fast and sure one. What makes that possible is the Baker wire line setting tool. A good setting tool is as important as a good plug.

Like the bridge plug itself, the setting tool is a Baker innovation. A Baker plug and Baker setting tool work well together because they were designed to do just that.

Leading wire line service companies set Baker Wire Line Bridge Plugs accurately and promptly using the Baker Wire Line Pressure Setting Assembly.

Other models of Baker Bridge Plugs can be set on tubing or drill pipe. They are all made in drillable, corrosion-resistant cast iron for permanent service, and in fast-drilling magnesium for temporary service.

BAKER WIRE LINE BRIDGE PLUGS

BAKER OIL TOOLS, INC. / HOUSTON / LOS ANGELES / NEW YORK

BAKER

Some light on whose crude runs are high

WHO IS RESPONSIBLE for the high refinery runs and excessive product stocks that have endangered the industry's stability for months?

That mystery has caused much name calling and finger pointing—but with little statistical verification because many companies refuse to disclose their run figures.

Now some facts are available, thanks to the Texas Railroad Commission and other state bodies that require refinery-run reports (see page 112).

THIS EVIDENCE WARRANTS the conclusion that a few of the largest refiners are responsible for a major part of the output of refined products in excess of the rate of consumers' use.

During September, when runs were declining but still higher than almost everybody considered necessary, total runs averaged 82.5% of U. S. capacity. But of the 12 majors reporting national runs to the Texas Railroad Commission, 8 had September runs above this percentage of their capacity—ranging from 84.9 to 91%, and averaging 88% for the group.

This means that all the rest of the industry—more than 150 companies—ran at an average of 78% of capacity. These eight majors have 46% of U. S. capacity and ran 49% of all crude in September. Six of the eight admitted that their own gasoline stocks were excessive (OGJ, Oct. 31, p. 62).

A different month, and a more inclusive list, might show a different group of companies out of line with the industry average. And of course there may be valid explanations. Fluctuations in a particular plant's activity may be due to various special circumstances. Some companies have gained markets while others have lost. It could not be expected that all refineries would run at the same percentage of capacity.

But what baffles the industry is that every refiner, big or little, habitually says that its own runs are not excessive for its own markets. Yet when total runs and stocks are above market requirements it is obvious that somebody has been making more than he can sell.

Twenty-one companies have 81.2% of U. S. refining capacity, while 146 share 18.8%. In both groups there are some that have overproduced. But when a company with several hundred thousand barrels of capacity ups its runs by one or two percentage points it can produce more surplus than a dozen small plants going full blast.

MORE FIGURES on individual runs should be made available. It would help the whole industry to balance its operations. It would give meaning to companies' explanations of their individual situations and end intraindustry suspicions and accusations.

Most refiners disclose their runs when asked. A few do so only when forced by state authorities. Getting such figures on the public record throws a lot of light on the mystery of why supply and demand can't be kept in balance.

lower
your
cost of
possession

2 Nickel Alloy Steels provide

A simple plan to save money by Steel Standardization

How many types of steel do you normally use?

Chances are you should examine your needs for alloy steel to see how many can be satisfied with just two types, 4340 through-hardening and 4620 carburizing.

You are likely to find that most of your engineering requirements can be met with confidence when you *standardize* on these two general-purpose steels.

You simplify inventory and materials-handling. You save money in purchasing and production, too.

• 4340 stands alone among medium-carbon steels in its ability to provide maximum strength, ductility, toughness and resistance to fatigue in parts of medium to heavy section.

• 4620 is a carburizing type that has consistently proved itself the ideal steel for a wide variety of carburized parts. 4620 is easy to carburize and has a minimum tendency toward distortion in heat treatment.

Available From Steel Service Centers

Both 4340 and 4620 are stocked by Steel Service Centers from coast to coast, ready for off-the-shelf delivery in a variety of sizes.

When you have carried your standardization plan as far as you can and you still have specialized needs to fill, the right nickel steels are available to give you extra performance or even lower costs.

For a buyer's guide to Steel Service Centers that stock 4340 and 4620, and other nickel-containing grades, simply write Inco.

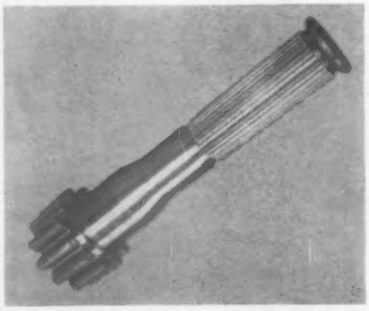
INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

STEEL SERVICE CENTER INSTITUTE

Holding the Shippingport nuclear reactor's top head to its shell section is a job performed by 42 studs of AISI 4340. This through-hardening nickel steel provides essential strength and toughness.

Power-packed tractor features unique drive mechanism composed of regular gear transmission, clutch and torque converter with lock-up, utilizes nickel alloy steels in more than 25 components.



Swing shaft for giant power shovel made from 4340 nickel alloy steel for strength and toughness to take shock-loading in stride. This 9"-diameter, 36"-long shaft of 4340 nickel alloy steel transmits tremendous torque to a giant ring gear.

Sustained accuracy is assured in this heavy-duty milling machine by spindle and gear components of AISI 4340 and 4620 nickel alloy steels. They provide needed strength and wear resistance.

Picture Is Brighter After Three Quarters

	Net income $1,000		%	Refinery runs Barrels daily		%	Liquid production Barrels daily		%
	1960	1959	change	1960	1959	change	1960	1959	change
Jersey Standard	501,000	447,000	5.0	2,856,000	2,770,000	3.1	2,505,000	2,461,000	1.8
Texaco	278,984	261,854	6.5	.....	.....	...	.....	.....	...
Gulf	237,910	216,475	10.0	743,900	684,000	8.8	1,481,000	1,328,300	11.5
Socony Mobil	135,900	123,000	10.5	.....	.....	...	.....	.....	...
Shell	104,308	104,056	0.2	504,000	494,000	2.0	319,000	317,000	0.6
Indiana Standard	102,826	106,189	–3.2	.....	.....	...	.....	.....	...
Phillips	78,920	77,386	2.0	232,799	236,424	–1.5	280,423	258,781	8.4
Continental	45,435	45,330	0.2	183,488	178,595	2.7	197,918	186,356	6.2
Sun Oil	34,852	32,151	8.4	231,664	233,120	–0.6	149,704	125,573	19.2
Sinclair	34,504	34,571	–0.2	419,214	429,486	–2.4	179,931	177,151	1.6
Tidewater	31,351	27,832	13.0	243,000	.....	...	114,000	.....	...
Sunray	29,078	30,783	–5.5	146,000	154,000	–5.2	79,700	76,600	4.0
Ohio Oil	27,410	27,323	0.3	100,211	103,149	–2.8	108,613	109,448	–0.8
Atlantic Refining	27,405	25,429	7.8	191,100	194,800	–1.9	152,000	134,700	12.8
Richfield	20,776	18,189	14.2	148,511	137,168	8.2	75,770	70,876	6.9
Skelly	17,122	19,109	–10.4	50,274	49,705	1.1	62,932	64,645	–2.6
Ohio Standard	.....	.....	...	130,083	133,994	–2.9	39,912	40,682	–1.9
Delhi-Taylor	3,050	2,730	12.0	40,400	40,360	0.1	5,766	5,839	–1.3

Economy Efforts Showing Up in Profits

• Together with firmer product prices and greater sales, increased efficiency is making 1960 look like a pretty good year after all. Most companies are running well ahead of 1959, and declines in profits are the exception.

THE oil industry is beginning to get a payoff from its belt-tightening campaign, and the profits indicate that 1960 will be a better-than-average year for most oil companies.

Third-quarter earnings now being announced are generally much better than those recorded in the same period last year. Also they are going far toward making up for dismal profit showings made throughout the industry in the first half.

This shows up clearly in Oil and Gas Journal surveys. At midyear, 10 of the larger companies reported net income lower than for the same period last year. By the third quarter only four were earning less (OGJ, August 8, p. 44).

Some companies have turned in outstanding performances. Both Continental and Tidewater, for example, reported their earnings for the first 9 months and for the third quarter alone set new company records.

Sinclair's net was 61% higher than for the third quarter last year; and Atlantic had a third-quarter net 30% higher than last year.

Net returns were averaging from 5 to 15% higher for the 9 months over last year. Declines in profits were the exception.

Oil executives attributed the improved profit picture to a variety of factors. Most often mentioned were greater sales volume, especially of natural gas and petrochemicals; better product prices since the first quarter, and more efficient company operations.

The markets . . . The key factor, naturally, has been the firmer tone of both the crude and product markets.

During the first quarter excessive inventories of products had depressed product prices and in turn eroded the price of crude.

Decision of the Texas Railroad Commission to hold crude production closer to market demand eventually tightened the markets for both products and crude. As a result, prices were better in the second and third quarter; and profits reflected this improved position.

The tight production program for Texas apparently has not squeezed the oil companies too severely. Nearly all report an increase in liquid production for the first 9 months over the same period last year.

For some, this reflected stepped up production abroad or in fields outside Texas. It also stemmed from the great-

Drivers Watch Pennies Closer

• Price, credit, trading stamps are gaining in importance as factors in the motorist's choice of a service station.

THE MOTORIST is becoming increasingly price and credit conscious.

And premiums (such as trading stamps) are more of a factor in his selection of a service station.

These are some of the changing buying patterns apparent in a survey of 4,500 U. S. motorists interviewed during the first 4 months of this year in a study sponsored by the Du Pont Co. Answers were compared with similar surveys 4 and 8 years ago.

Here are the salient trends pointed up in the survey.

Of those who usually patronize a single station, 27% cite price, credit, or premiums as the reason, compared with 17% in 1952. Twice as many motorists gave price as the reason for brand loyalty as in 1952.

Thirty-five per cent of those who shopped around for oil cited price as compared with 25% 8 years ago. Six per cent, compared with 5% in 1952, said they changed their own oil.

More than one-third of those who switched stations recently said they did so because they had moved into a new neighborhood. Motorists buying at the same station for less than a year increased from 10½% in 1952 to 17½%.

About 70% buy gasoline by the tankful, 25% buy "so many dollars worth," and 5% buy "so many gallons."

Regular gasoline is generally purchased by 58.2% of those interviewed compared with 48.5% in 1952. The group which said it usually bought half regular, half premium declined from 10.4% to 2.7%.

Oil changes are made after 2,000 miles by 34%; 2,000 to 3,000 miles, 8%; more than 3,000 miles, 8%; unspecified, 17%; and 22% cited oil condition as the reason. Thirty motorists cited engine noise or the oil gage. One per cent said they added 12 quarts or more between changes; one man said he added 35 quarts between changes.

Credit-card buying increased from 12% in 1952 to 18% in 1956 and 24½% in 1960. Credit cards were used by 40.6% in the West and only 18.7% in the Northeast.

The average motorist drives 12,300 miles a year, of which 1,700 miles, or 14%, is on vacation.

er volume of liquids extracted from increased sales of natural gas. Only a few companies reported their liquid production for the 9 months was less than last year.

On the other hand, a majority of the larger firms reported they held refinery runs at lower levels during the first 9 months.

With this generally tighter rein on field and plant operations, emphasis of management turned to pushing sales of natural gas and the more profitable line of products.

President Henderson Supplee, Jr., of Atlantic Refining Co. noted that his company had managed to achieve a better product mix with emphasis on the more profitable lines to boost operating revenues. This was reflected in increased sales of premium gasoline, chemicals, and natural gas.

Gulf and Sinclair also emphasized the higher levels of petrochemical sales as a factor in their improved earnings.

Operations picture . . . A major contribution to brighter earnings, however, has been new efficiency and overall economy achieved by oil management.

These achievements came through:

. . . **Operating efficiency.** Sun reported its gross income down for the 9-month period but net up. Tidewater noted it was getting a payoff in efficiency and greater earnings from a recent program of capital rebuilding.

. . . **Lower payroll costs.** This was a factor in better earnings for several companies and was mentioned specifically by Atlantic Refining.

. . . **Restricted and more selective drilling.** Skelly reported the number of well completions off this year but the quality of wells much higher. The company completed 9 out of 29 gross wildcat wells with 31% productive. This compares with the national average of 16.2% successful.

Delhi-Taylor also increased its success ratio under a program emphasizing fewer but more successful exploration ventures. Continental tightened up on its development costs and made a smaller provision for possible loss in operations abroad. Sun revealed it has been following a restricted drilling policy.

A majority of the companies, particularly Jersey Standard and Indiana Standard, mentioned they were getting good results from company-wide economy programs instituted more than a year ago.

Rest of the year . . . With a profitable pattern set by operations in the first 9 months, most large companies will close out a fair year in the fourth quarter.

Much depends on the weather. Some really cold days are needed to boost sales of fuel oil, LPG, and natural gas for household heating.

Atlantic Refining President Supplee expressed his optimistic outlook this way:

"We are beginning to see the combined results of improvements not only within Atlantic but in the industry as a whole . . . The actions of state regulatory bodies in keeping supplies of crude oil in better balance with demand is adding stability to the price structure in our industry. This has been particularly evident during the last few months."

Court Nips Attack on Small-Tract Drilling

THE TEXAS Supreme Court has blocked another attack on the Texas Railroad Commission's policy of alloting production to small-tract wells.

And the court's ruling may have the effect of keeping many similar suits from being filed.

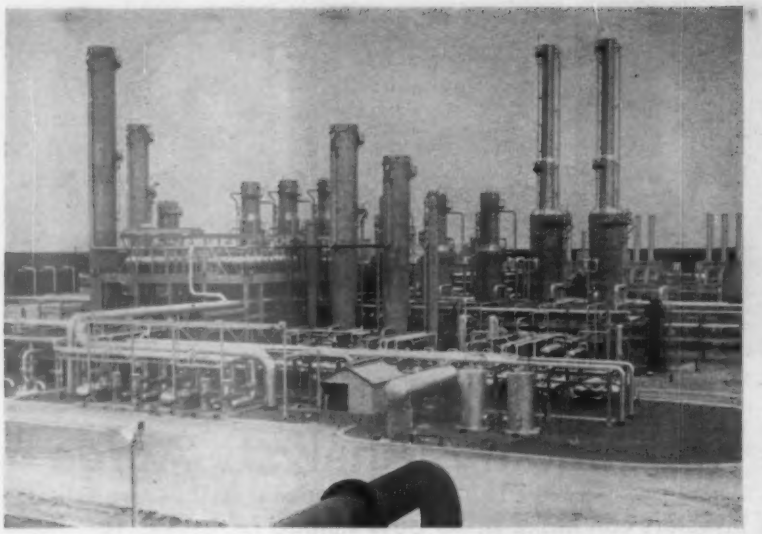
Specifically, the court refused to grant a writ of error in a district-court ruling on a suit filed by Pan American Petroleum Corp. and Humble Oil & Refining Co.

The suit involved a well drilled on a 5-acre tract under a Rule 37 exception. W. A. Moncrief, Jr., Fort Worth, drilled the well in the Emperor Devonian and Ellenburger gas area of Winkler County, West Texas. Regular field spacing is on 320 acres.

Humble and Pan American filed suit to contest the commission's allocation formula based two-thirds on acreage and one-third on the well. The companies argued that this gave Moncrief far more than his rightful share of field gas production.

The district court ruled that the companies had waited too long to file the suit. The decision was upheld by the Third Court of Civil Appeals in Austin before going to the State Supreme Court.

The courts ruled only on the time element—not on the merit of the allocation formula. This will permit further tests of the basic issue when the commission rules on similar cases in the future.



King Ranch Gas Plant Tops All

. . . in processing and cycling. And already there's talk of stepping up the output of Humble's king-size facility.

THE WORLD'S biggest gas-processing and cycling plant—the King Ranch plant of Humble Oil & Refining Co.—is now processing gas at the rate of 545 million cubic feet a day, and already there is talk of boosting this to 800 million cubic feet.

Peak capacity of the king-size plant, which started operating in September, is figured at 950 million cubic feet.

Five years of planning and a year of construction went into the plant. Total cost, including field gathering facilities and a 30-in. pipeline, was $68 million.

Gas is fed to the plant from 13 fields through a pipeline network. A 30-in. line, 238 miles long, carries residue gas from King Ranch to Houston (OGJ, Oct. 12, 1959, p. 95).

Heart of the plant, located on a 150-acre site, is the compressor building. Thirteen compressors in the 475-ft.-long building inject part of the residue gas into reservoirs.

The plant has five 90-ft. towers and a 144-ft. deisobutanizer. The cooling tower rises 3 stories.

Actual operation of the plant is handled by 33 men—11 on each of three shifts. Engineers, laboratory technicians, and maintenance men bring the total of employes to 125.

What the plant does . . . Wet gas from the field is piped through a series of towers. The gas flows through absorbent oils which extract liquid hydrocarbons, leaving the residue or "dry" gas.

Some of the dry gas is injected into reservoirs to recover more liquid hydrocarbons and to maintain reservoir pressure. Some is used as plant fuel.

Most of the dry gas is moved by the 30-in. pipeline to industrial areas on the Texas Gulf Coast.

Extracted liquids are fractionated into ethane, propane, isobutane, normal butane, and natural gasoline. The bulk of the ethane, propane, and normal butane is sold to petrochemical plants in Southwest Texas. Isobutane and heavier liquids are shipped by pipeline for further processing in a Corpus Christi refinery.

Public-Land Fee Increase Is Shelved

• After spate of protests, Interior abandons proposal to charge $1 an acre during latter half of 10-year leases. Department admits holes in the plan.

INTERIOR DEPARTMENT has backed down on its plan to hike the fee on non-competitive lease rentals of U. S. public lands to $1 an acre a year for the second 5 years of a 10-year lease.

Instead, the fee will be 50 cents an acre for each of the 10 years.

Leasing-rule changes passed by Congress this year provided a "floor" of 50 cents an acre per year and eliminated the practice of waiving the fee for the second and third years of a lease.

However, Interior recently suprised the industry by announcing a proposal to increase the fee to $1 an acre during the last 5 years of a lease.

The net effect of this proposal would be a total 10-year fee of $7.50 an acre instead of the former fee of $3.50 under the old waiver system, or $5 under the minimum rental ordered by Congress.

Interior was within its legal rights in proposing a higher fee because Congress had set a minimum, not a maximum.

Even so, many oil-industry people and western-state congressmen were irked by Interior's move, because the department had shown no indication of wanting a higher fee when the minimum proposals were being discussed in Congress.

Therefore, a wave of protests developed after Interior revealed its plan for higher rates.

Last week, Interior Secretary Fred Seaton withdrew the proposal, saying that Interior had become convinced that a rate higher than 50 cents an acre would retard exploration and development of public lands and might work a hardship on smaller operators.

Even with the fee matter now settled, there are still other points to be ironed out before new leasing regulations will be issued.

One of these points concerns what steps a leaseholder must take to retain his lease if it is proved that the person from whom he purchased the lease acquired it illegally. The intent of Congress was that a bona fide purchaser would be protected, but it is up to Interior to spell out what type of proof is required and how and to whom it is to be presented.

Another unsettled point involves filing of options. Congress wanted these option filings to be made public, but left to Interior the problem of working out details, including time limits.

C. W. Haynie

R. W. Hammell

R. G. Bennett

L. E. Fourton

Domestic Oil Is Rebounding, Analysts Agree

• Panel decides investors can make good buys among oil issues. The views range from low-key optimism to a cheery belief that oil "has seen its low." Looking abroad, the securities men find small chance of a boom in earnings.

THE DOMESTIC oil industry has solved many of its problems and is more attractive to investors than it has been for the past 2 or 3 years.

But the outlook for earnings growth on foreign operations is less certain.

This is the consensus of a panel of petroleum analysts who discussed the industry outlook last week before the New York Society of Security Analysts. The four-man panel was generally less bullish on oils than recently published analyses which conclude that the industry has turned the corner and is definitely on the way back up.

But the analyst seemed to agree that the selective investor can find very attractive issues among the oils at this time—especially among the domestic oils.

Leslie E. Fourton, Hayden Stone & Co., was chairman of the panel which also included Charles W. Haynie, Loeb Rhoades & Co.; Robert G. Bennett, Adams Express Co.; and Raymond W. Hammell, the Bank of New York.

Domestic outlook . . . Opinion was divided as to the extent of the domestic industry's recovery from the recession of the past 2 or 3 years occasioned by excess producing and refining capacity.

The more optimistic view was taken by Bennett, who feels that "oil has seen its low." He said the investor must look at the oils differently from the viewpoint held immediately after World War II when the industry growth was explosive.

"This is a new era for oil," Bennett said. "Old standings don't necessarily mean too much. Companies which have been on top won't necessarily remain there. Those which received little attention formerly may do very well. All companies have their problems. But there are very attractive investment opportunities in oil if you look carefully."

Haynie said the industry had not overcome all its problems, although its position was stronger.

"The domestic companies have the best opportunity to recover," Haynie said. "For the short term, weather will be the controlling factor in whether prices hold, and hence what happens to profits. If there is a normally cold winter, products prices will hold and the fourth quarter will show more improvement over 1959 than did the third quarter, which was very good.

"If there is a mild winter, oil will be in trouble next spring. I see no material change in the outlook for oils in the near future."

Fourton said the domestic industry is in a position to go forward again.

Effect of imports quotas . . . Haynie said imports restrictions and proration of crude-oil production make the domestic industry look attractive.

"Imports quotas have served to stabilize crude prices," he said. "They have prevented a flood of cheap crude at prices 75 cents to $1 under domestic crude. This program should keep the domestic industry protected quite a while."

Differing views were expressed by Bennett and Hammell.

"I don't believe the imports program has materially improved the position of the domestic petroleum industry," Bennett said, "but, in my opinion, together with the proration activities of the Texas Railroad Commission in particular, it has saved the domestic crude-oil producers from chaos."

Bennett said the benefits which might have accrued to domestic refiners have so far been largely offset by excessive refinery runs, which have had an effect on prices similar to a deluge of cheap imported oil. The effect of quotas will continue to be influenced by other industry activities such as the level of refinery runs and state proration.

"But it is my belief," Bennett said, "that quotas will become increasingly helpful to the domestic industry as time goes by."

Hammell took the position that quotas had checked "industry deterioration," but don't make the domestic industry more attractive.

Domestic earnings outlook . . . Haynie expects profit margins for domestic integrated companies to improve, particularly if weather is favorable and refinery runs aren't excessive.

Bennett pointed out that "it's important to remember that we don't have to go back to 1957 product prices to get 1957 profit levels." He cited record third-quarter earnings of some companies as evidence that earnings can come back .

"The oil industry was formerly so inefficient and wasteful in all phases—it drilled too many wells and bought acreage often just to be represented in an area. But this has stopped," Bennett said.

Hammell pointed to internal econ-

omies through reorganization, automation and resulting payroll trimming which saved large sums.

Fourton said one of the most important factors in the industry, ability to improve earnings, was discretion in exploratory and development programs which permit a single company to cut expenses by millions of dollars in a single year.

Natural gas outlook . . . The panel was divided also on the effect of the Federal Power Commission's new area-pricing system on natural-gas earnings.

Haynie said area pricing, while relieving small producers from a paperwork burden, leaves a lot to be desired, but over-all is "somewhat favorable."

"I think area pricing is constructive," Hammell said. "In a couple of years the good side of the ruling will show up. It will be that long before legal questions are settled, since there is no precedent for this pricing system."

Domestic drilling picture . . . The panel felt that drilling recovery will not be so rapid as was thought earlier.

Members cited the trend of major companies toward increasing reserves by purchases and mergers where possible, and by secondary recovery. Both factors, they agreed, will act as deterrents to direct development of reserves.

"Not only can reserves be purchased at costs below those which would be incurred through exploration and development," Bennett said, "but for the first time in a number of years substantial quantities of domestic reserves are available. Another consideration is that through financing such acquisitions by the use of oil payments, the immediate investment by the purchaser is rather small and he obtains low-cost reserves when the oil payment has been satisfied.

"This generally takes anywhere from 7 to 10 years. Meanwhile the purchaser obtains just enough net earnings accruing to his interest to cover operating costs, so that it has no material effect on his profits.

"However, when the oil-payment period has expired, he has available a substantial increase in net production at a time when he probably will be able to use it to much greater advantage and at greater per-barrel profit than is possible today. It is more profitable for the seller, too, and helps to solve ownership problems."

Bennett said oil in the ground is worth less today in relation to the price of crude than it was 5 years ago. The discount factor of 5 to 6% a few years ago would not be considered a buy today, he said.

Foreign outlook . . . While agreeing that the profits picture for international operations is less favorable than for U. S. domestic operations, petroleum analysts split on the importance of the factors involved.

They pointed to price weakness resulting from oversupply. This situation is complicated by major new sources of supply such as Libya and Algeria, the rapid growth of Russian cut-rate exports, and entry of new companies into the world market.

"Supply will continue to grow much more rapidly than demand in the next several years," Hammell predicted, in spite of large increases in consumption.

"With newcomers getting a share of the market, the international companies will have a smaller percentage of the total," Hammell said. "Other countries such as Brazil and Australia may enter the picture in a few years."

Bennett said he was "not much more optimistic than Hammell." He expects supply pressure to continue for the foreseeable future.

Haynie was more optimistic for foreign-earnings improvement.

"Volume can overcome a lot of problems," he said. "If volume continues to increase as forecasts indicate, the picture can change. Total earnings for foreign companies this year are close to last year. If this is the bottom on prices, and recovery sets in, we can expect a rapid improvement in profits."

The panel forsees a steady increase in foreign drilling, in contrast to the domestic outlook, in spite of the current oversupply.

International proration . . . The panel saw no possibility of international proration by exporting countries as has been discussed by the Middle East and Venezuela.

If it should come about, however, it would work to the detriment of the international companies, providing another edge for governments to control the industry, Hammell said.

Russian influence on market . . . The panel was divided as to Russian impact in the world market.

Hammell said Russian activity could cause continued price pressure. He cited sales at 25 cents a barrel under the market, the Soviet's willingness to accept goods rather than currency, and the Russian drive to gain a larger share of the market.

Russian free-world exports last year amounted to 280,000 bbl. daily. Hammell said they might increase to 700,000 or 1,000,000 bbl. daily in 5 to 7 years.

Haynie, however, saw Russia more as a thorn in the flesh than a threat to take over a sizable share of the world market.

"Russia will continue to aggravate the market, going in and out, but I don't believe export volumes will grow so fast," he said.

Bennett Calls Depletion Vital

THE REPUBLICAN Administration's position on oil and gas industry problems was underlined by Interior Under Secretary Elmer Bennett last week.

Bennett termed retention of percentage depletion "most important."

He said that utility-type regulation of natural-gas producers should be lifted, and urged legislation to achieve this.

He also proposed that a study be undertaken at once—with government and industry participation—to determine whether below-cost sales of natural gas have an adverse effect on producer prices and "on sound competitive relationships."

Bennett's views were expressed at the annual meeting of the West Central Oil and Gas Association in Abilene, Tex.

The under secretary also assured his producer audience that the Republican Administration would continue to vigorously support and administer an oil-import control program to help maintain a healthy domestic industry.

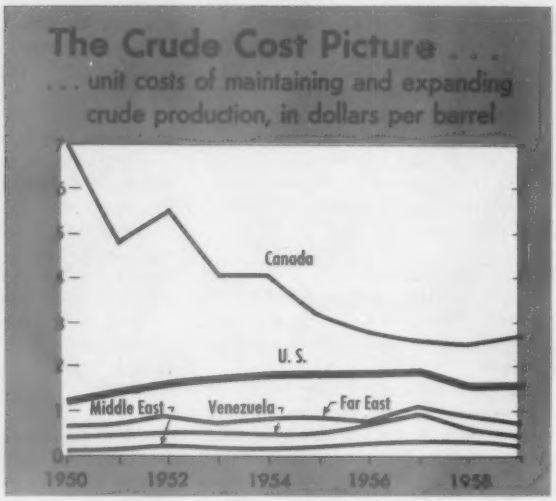
In spelling out the administration's views on percentage depletion, Bennett said even the threat of efforts to make changes in these provisions depresses producer activity "because of the business uncertainty resulting from them."

Regarding natural gas, Bennett said the removal of utility-type regulation would provide an important incentive for the growth of the industry.

He called attention of his listeners to the recent plan proposed by Interior to adjust import levels of crude imports downward.

Bennett revealed that a presidential proclamation which would authorize implementation of Interior's proposals would probably be issued soon so the revised rules could become effective with the January allocation period.

Bennett also assured the group that he does not subscribe to the theory that the U. S. will have to become increasingly dependent on foreign oil to meet its basic energy needs.



Oil Spending on Upswing Again in '59

Where the Money Went

In 1959:

Department	Million Dollars: United States	Other Countries	Free World	Per cent of total: United States	Other Countries
Production	4,000	2,030	6,030	73.7	35.2
Pipelines	135	440	575	2.5	7.6
Tankers and other marine equipment	125	1,280	1,405	2.3	22.2
Refineries	350	850	1,200	6.5	14.7
Chemical plants	175	170	345	3.2	2.9
Marketing	450	885	1,335	8.3	15.3
Others	190	120	310	3.5	2.1
Total	5,425	5,775	11,200	100.0	100.0

Over past 10 years:

Area	1959: Million Dollars	1959: Per cent of Total	1950-1959: Million Dollars	1950-1959: Per cent of Total
United States	5,425	48.4	50,100	59.6
Canada	650	5.8	5,175	6.1
Venezuela	475	4.3	4,764	5.7
Other countries	850	7.6	3,520	4.2
Western Hemisphere	7,400	66.1	63,559	75.6
Europe	1,150	10.3	6,565	7.8
Africa	575	5.1	1,805	2.1
Middle East	425	3.8	2,840	3.4
Far East	400	3.6	2,816	3.4
Eastern Hemisphere	2,550	22.8	14,026	16.7
Unallocated (incl. foreign flag tankers)	1,250	11.1	6,440	7.7
Total	11,200	100.0	84,025	100.0

CAPITAL expenditures by the free-world petroleum industry amounted to $11.2 billion last year, with 48.4% of the total being made in the United States and 51.6% abroad.

It was the second consecutive year in which the combined spending of other countries for replacement and expansion of property, plant, and equipment exceeded that of the United States, a study by the Chase Manhattan Bank, New York, revealed.

U. S. expenditures of $5.4 billion were lower than in 1955, 1956, and 1957. A record of $6.4 billion was set by this nation in the latter year.

But for the rest of the free world, the 1959 expenditures of nearly $5.8 billion were the greatest ever made And for the second straight year, the combined spending of these other countries for replacement and expansion of property, plants, and equipment topped U. S. expenditures.

The over-all 1959 total was $500 million higher than the $10.7 billion spent by the free world in 1958, and only $200 million beneath the all-time peak of $11.4 billion in 1957.

The Chase Manhattan report, prepared by Frederick G. Coqueron, petroleum analyst of the bank's petroleum department, also listed the free-world industry's outlay for the 1950-59 period at $84 billion. Of this total $50 billion, or 60%, was spent in the U. S.

Gross investment in fixed assets increased 2.8 times while crude-oil production, refinery throughput, and consumption were up twofold. Gross investment in fixed assets increased from $34.6 billion at the end of 1949 to $97.3 billion at the end of 1959,

with $54.7 billion, or 56%, of the total in the U. S.

American companies also invested heavily abroad. Of the $42.6 billion total in fixed assets outside the U. S., this country was responsible for $16 billion. U. S. enterprises accounted for 55% of free foreign crude-oil production and 42% of refinery runs last year.

U. S. interest in foreign fixed assets was 59% in Canada, 64% in Venezuela, 47% in the Middle East, 24% in western Europe, and 27% in other countries.

Spending by industry division . . . The allocation of oil-industry capital among the various operating branches varies widely between the U. S. and other countries.

Production requires the largest single outlay of any branch, both in the U. S. and abroad. The share of capital going into production in the U. S. is about double that of other free-world countries.

In 1959, U. S. firms put 73.7% of their capital into production, compared with 35% for other countries. For the 10-year period, the figures are 71.9% and 37.7%. This item includes the cost of drilling dry holes, lease-concession acquisitions, geological and geophysical work, and lease rentals.

On the other hand, refining, marketing, and tankers take a bigger share of foreign oil capital than these operations do in the U. S. (See table.)

Production costs vary . . . Of the major producing countries, Canada spends more per barrel of crude production to maintain and expand crude production, followed by the U. S. (See table and chart.)

During the past 10 years, the U. S. industry spent $41 billion to expand crude production, more than 2½ times the amount spent abroad. But U. S. crude production last year was only 42% of the free-world total.

Canada's unit costs have declined steadily as production increased, but remain relatively high, partly because the producing rate is only about half of capacity. U. S. unit costs have increased every year of the past decade except for 1958 and 1959.

The high productivity of wells in Venezuela and the Middle East is reflected in low unit costs for those areas.

These unit costs computed on the basis of crude production alone do not tell a complete story, as no credit is given for natural gas and natural-gas liquids production—significant in the U. S. and growing elsewhere as well. But the figures should point to the trend in costs of expanding production.

More Air Force Lines Likely

• Government figures it's saving more than $3 million a year with pipeline service to 22 bases.

MORE THAN 500 miles of pipeline will be serving Air Force bases throughout the nation when fuel lines now approved or under construction are added to the 22 in operation.

The existing pipelines total 470 miles. Seven lines, adding up to 66 miles, are in the works.

At least nine additional bases are being considered for direct pipeline connections.

Pipelines deliver from 1,500 to 6,500 bbl. a day to each base in the system. When the pipeline program is finished, total deliveries are expected to range between 115,000 and 135,000 bbl. daily.

Seventeen of the lines currently operating are 6-in. facilities. Most others are 4 to 8-in. lines. Length ranges from 1 to 115 miles, with the longest line connecting Southern Pacific Pipe Line Co.'s Phoenix, Ariz., terminal and Davis-Monthan Air Force Base outside Tucson.

The Government pays about $850,000 a month for air base pipeline service. Apparently the program is economical for the Air Force and profitable for the pipelines. The Air Force says it has saved more than $3 million in the past fiscal year and more than $20 million since the program was inaugurated in 1954.

Bases Now Served by Pipeline

Name & Location of Base	Diameter (Inches)	Length (Miles)	Source of Product (Carrier)
Barksdale, Shreveport, La.	8	7	Texas Eastern Transmission Co.
Biggs, El Paso, Tex.	6	9	Pasotex Pipe Line Co.
Davis-Monthan, Tucson, Ariz.	6	115	Southern Pacific Pipe Line Co.
Dyess, Abilene, Tex.	8	91	Trust Pipe Line Co.
Fairchild, Spokane, Wash.	8	21	Yellowstone Pipe Line Co.
Geiger, Spokane, Wash.	8	21	Yellowstone Pipe Line Co.
Griffiss, Rome, N. Y.	6	11	Buckeye Pipe Line Co.
Hunter, Savannah, Ga.	6	7	Georgia Pipe Line Co.
Lincoln, Lincoln, Neb.	6	10	Great Lakes Pipe Line Co.
Little Rock, Little Rock, Ark.	6	23	Okla.-Miss. River Products Line
Lockbourne, Columbus, Ohio	8	13	Ashland Oil Co.
Luke, Phoenix, Ariz.	6	20	Southern Pacific Pipe Line Co.
March, Riverside, Calif.	6	15	Southern Pacific Pipe Line Co.
Mather, Sacramento, Calif.	3	3	Southern Pacific Pipe Line Co.
McClellan, Sacramento, Calif.	4	9	Southern Pacific Pipe Line Co.
McConnell, Wichita, Kans.	6	7	Cherokee Pipe Line Co.
Schilling, Salina, Kans.	6	1	Kaneb Pipe Line Co.
Sheppard, Wichita Falls, Tex.	4	4	Continental Pipe Line Co.
Tinker, Oklahoma City, Okla.	4	10	Cherokee Pipe Line Co.
Walker, Roswell, N. M.	4	36	Continental Pipe Line Co.
Webb, Big Spring, Tex.	6	2	Trust Pipe Line Co.
Williams, Chandler, Ariz.	6	35	Southern Pacific Pipe Line Co.

Bases With Lines Approved or Building

Blytheville, Blytheville, Ark.	6	13	Blytheville River Rail Terminal
George, Victorville, Calif.	8	3	Calnev Pipe Line Co.
K. I. Sawyer, Marquette, Mich.	6	5	National Pipe Line Co.
McGuire, Wrightstown, N. J.	6	24	Interstate Storage & Pipeline Co.
Mountain Home, Idaho	4	11	Astro Corp., Dallas, Tex.
Nellis, Las Vegas, Nev.	6	8	Calnev Pipe Line Co.
Wright-Patterson, Dayton, Ohio	6	2	Sohio Pipe Line Co.

Bases Under Consideration for Pipelines

Altus, Altus, Okla.
Amarillo, Amarillo, Tex.
Cannon, Clovis, N. M.
Carswell, Fort Worth, Tex.
Ellsworth, Rapid City, S. D.
Forbes AFB, Topeka, Kans.
Glasgow AFB, Glasgow, Mont.
Kincheloe AFB, Kinross, Mich.
Kirtland AFB, Albuquerque, N. M.

Tests for MS Oil Debated

. . . at SAE meeting. Oil companies challenge the validity of auto firms' tests in predicting field performance.

DO THE automobile industry's tests actually measure lube-oil performance in severe service?

Some oil companies say no. The car makers insist that the tests do predict field performance.

The differing views were given another airing last week in Tulsa at a meeting of the Society of Automotive Engineers.

The auto industry developed the tests because it believes the API statement classifying MS oil is too general. Motor oil marked MS should have to meet some acceptable service standards and there should be a simple method of telling customers how to buy motor oils that fit their engines, the car makers say.

The test sequences involve the use of three engines run at varying conditions to evaluate oil performance and set down minimum requirements for "Service MS."

Many oil companies agree that the intent of this test sequence is fine, but, to have value, the test should correlate with some realistic field tests.

The real question to be answered then is: Do the sequence tests predict field performance?

Data presented by the oil companies indicated that they do not. Data presented by the auto manufacturers reached the opposite conclusion.

Oil industry findings . . . Enjay Laboratories concluded that the first three of the five sequence tests show some differences between motor oils which have not had much additive treatment. However, they said, at intermediate and high additive treatment, the tests are insensitive to differences in motor oils.

The Sequence V test (which is designed primarily to measure sludge and varnish) does not consistently predict the field performance of blended lubricants, Enjay said. And one of the tests's major limitations is its inability to predict, at all additive levels, the advantages of the new dispersant VI improvers in sludge and varnish control.

Therefore Sequences I, II, III, and Sequence V tests, Enjay concluded, do not qualify as industry standards for predicting motor-oil performance in the field.

Standard Oil Co. (Ind.) presented results which were obtained by running 12 different oils in 40 vehicles for over 2 million miles. Tests were run on both a taxicab fleet and a police-car fleet. Six-cylinder engines were used throughout the taxicab tests. The police cars had V-8 engines.

Standard's results showed that different makes of engines in the same test fleet at times gave widely different responses to different test oils.

The company's conclusion: The MS engine tests can at best be used to predict motor-oil performance in only one make of engine.

However, Standard said, the MS test is superior to some tests which have long been used in motor-oil development.

Although few problems were solved, many were aired. And most people could agree on one thing. The MS test provides a common ground for both the oil and automotive industry to discuss their mutual problems.

Equipment-Lease Firm Set Up

. . . by three oil men. They'll do business with producers who are looking for a way to skirt big outlays of cash.

THREE former executives of Fifteen Oil Co., Houston, have organized a new company to purchase production, compression and transmission equipment and lease it to producers who want to avoid heavy outlays of capital.

The company will be known as Diversified Petroleum Enterprises, Inc., and may be unprecedented in the industry.

William R. Haynes, president, said the company expects to do considerable business with gas producers whose reserves do not justify expensive compression equipment, but who would be willing to lease equipment for several years.

Haynes was vice president of Fifteen Oil, a company purchased recently by Tennessee Gas Transmission Co. Dixon H. Cain, former Fifteen Oil president, and Harry H. Hudson, former secretary-treasurer, are vice president and secretary-treasurer, respectively, of Diversified.

As its first job, the company is completing installation of a $125,000 900-hp. compression station for Liberty Gas Transmission Co. in the Hull field in Liberty County, Texas.

Diversified will maintain and operate the equipment it leases, if required. The producer may take an option to buy the equipment, although this would come at a premium.

Haynes said he expects to deal with major companies as well as small producers and also will work with manufacturers and fabricators who are seeking a "third party" needed to make a sale.

In time the company expects to accumulate considerable used equipment which, in turn, will be sold or leased again. It is the disposition of this equipment which should net a profitable return to the company.

Purchase of equipment has been arranged through insurance companies and financing companies, Haynes said.

But the Smile's Free

A TWO-BAY service station has been opened in Fairbanks, Alaska, by Union Oil Co. of California. Four pumps will provide quick service regardless of temperature.

Some prices: Regular gasoline, 54 cents a gallon; premium, 58 cents; car washing, $5.

INDUSTRY

Texas American Oil Corp., Midland, has bought working interests in four producing properties in West Texas and southeastern New Mexico from J. T. Miller, trustee. The deal involved part interests in a total of 840 producing acres in Nolan and Schleicher counties in West Texas and Eddy County in New Mexico. There are seven producing wells on the acreage. Purchase price was not disclosed. Texas American said the deal would add about 100,000 bbl. to the company's oil reserves. It plans added development drilling.

About $350,000 has been spent by Continental Oil Co. for three propane and butane underground storage caverns at Easton, La. The caverns, bought from Sales, Inc., are on a 120-acre tract in the Pine Prairie field salt dome, where more caverns can

AMA Study Suggests Office Manpower Waste

MANY COMPANIES, apparently unconsciously, are penalizing themselves with administrative costs much higher than their competitors'.

Variations in cost for similar jobs may run from the thousands to more than a million dollars annually, according to a study by the American Management Association.

Differences of 50% in manpower for standard administrative jobs are common, according to a survey among 88 corporations which include one oil company (Continental Oil Co.) and numerous suppliers of the industry.

There are variations of 200 and 500% in general administration work in two industry groups. And one company, as a result of the study, discovered it had 700% more employes in personnel work, in proportion to the total payroll, than another in the same industry.

The AMA reports that the study has already inspired economies ranging from $36,000 a year for one operation in one company to more than $1,000,000 a year by another. This was the purpose of the project—to disclose disparities and permit corrective action.

Manpower variation . . . The widest variations were found in design and research, as might be expected, and in marketing.

A great divergence in manpower use was found in separate administrative functions, too.

The tables tell the story in detail. Table 1 gives the high and low industry group figures compared with the average for all 88 companies in the survey. Table 2 examines subdivisions of administration by industry group.

Study continues . . . The rapid growth of administrative employes in the past decade, as automation caused a relative decline in production workers, brought about the study to control costs more closely.

New figures are gathered continuously, and company representatives meet several times a year with the AMA project steering committee to examine results in week-long analytical sessions. Other industry groups will be added to the study.

HOW MANPOWER USE VARIES
(% of total employes)

	High	Low	Avg.
Mfg. or processing	71.5	45.0	59.68
Design, dev. research	26.6	3.9	14.71
Marketing	24.1	3.5	11.87
General admin.	14.0	8.7	10.58

ADMINISTRATIVE USE OF MANPOWER

	% total	high	low
Acct., auditing	2.79	3.7	2.0
Personnel	1.22	1.9	0.7
Purchasing	1.13	2.0	0.5
Office services	1.32	2.1	0.9
Operations improvement	1.29	2.3	0.5
Tabulating, computing	0.96	1.6	0.5

LPG Storage Suit Settlement Assured

THE OWNERS of salt-cavern LPG storage have joined in an out-of-court settlement which will free their operations from royalty demands and possible lawsuits by the Sid Richardson estate.

About 100 companies contributed to the $1,500,000 settlement, including 60 primary owners of this type of underground storage, and some part-interest owners.

Those who participate in the settlement will be granted permanent immunity from the one-eighth cent per gallon royalty fee set by the Richardson estate on withdrawals of products from storage of this type.

Final disposition of the Richardson patent will be determined by the operators involved in the settlement.

The case was initiated by the Richardson estate in two federal court suits in Texas against Skelly Oil Co. and Pan American Petroleum Corp. The estate demanded royalties on LPG withdrawn from storage in Hockley and Carson counties, Texas (OGJ, July 18, p. 60).

BRIEFS . . .

be obtained if needed. Capacity at Easton is 333,000 bbl. of LPG. Meanwhile, Continental is spending $1,275,000 on underground storage near its Ponca City, Okla., refinery which will have a capacity of 200,000 bbl. of LPG.

A town-lot drilling lease on the Brentwood Country Club in suburban Santa Monica, Calif., has been taken over by Signal Oil & Gas and Richfield Oil Corp. The two companies, each with a 50% share in the lease, acquired the property from Mobil Oil. The only well drilled on the 143-acre lease was a 11,136-ft. dry hole completed by Mobil in August.

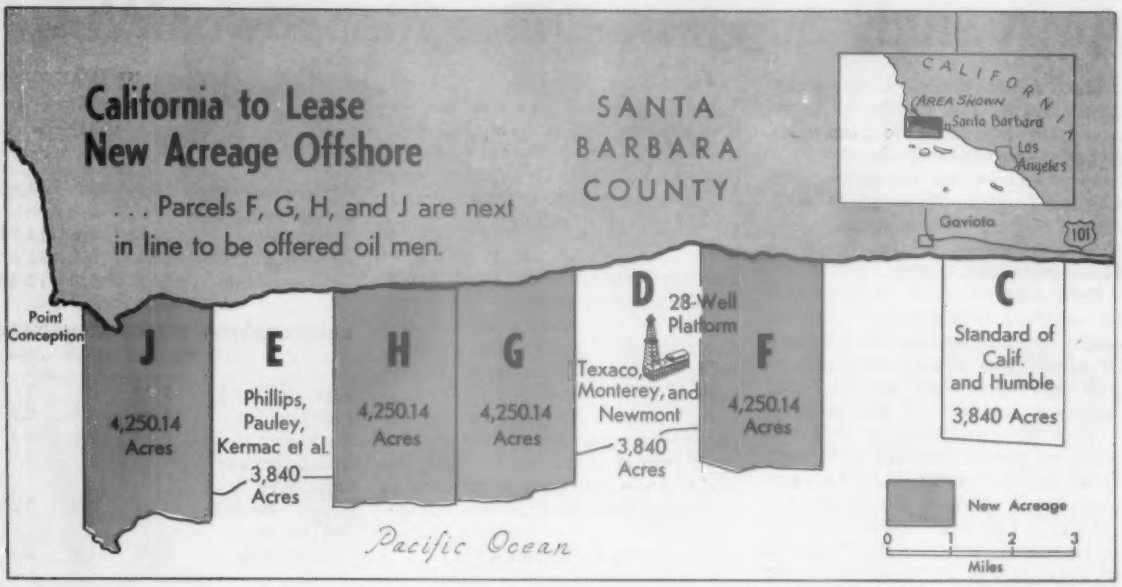
Two oil-industry labor unions operating on the West Coast are considering a merger. The two are Western States Service Station Union and the Independent Union of Petroleum Workers. They represent about 10,500 oil employes. Leaders of the two groups will meet late this month to discuss the merger.

More than $500,000 worth of oil and gas production has been purchased by Fred Whitaker, a Carthage, Tex., independent, from F. R. Jackson, a Longview, Tex., operator. Included are two 640-acre gas units in North Henderson field, Rusk County, Texas; full working interest in three Louisiana oil wells; and an undisclosed interest in one gas unit in Sugar Creek field, Claiborne Parish, Louisiana.

TULM Corp., a consultant company on foreign operations for four oil firms, has been dissolved but three of its officials will remain in business as consultants to the industry generally. Formed in 1957 with headquarters in Houston, TULM acted exclusively for Tennessee Gas Transmission Co., Union Oil & Gas Corp. of Louisiana (now Union Texas Natural Gas Corp.), Lion Oil Co., and Murphy Corp. Earle F. Taylor, president of TULM, said a new consultant company, Taylor & Associates, Inc., would continue to advise the four companies as well as others. Glen R. Neighbors and Stewart H. Folk are the other TULM officials in the new venture.

A 25,000-sq. ft. office building will be built at Baton Rouge, La., by Copolymer Rubber & Chemical Corp. at a cost of $750,000. The 2-story, open-type building will have walls of pressed-steel frames with opaque glass exterior panels.

A group of dissident stockholders has failed in an attempt to oust the management of Intex Oil Co., Bakersfield, Calif., exploration and producing firm. The group failed to get half of the 708,800 stockholders to vote for removal.



California Toys With Leasing Change

• State delays January sale to decide whether it wants to lease tracts one at a time rather than in groups. The reasoning: One tract with several bidders would net state more money. Industry reaction: 'Tain't necessarily so.

CALIFORNIA'S State Lands Commission is seriously considering leasing offshore acreage one tract at a time rather than several tracts at a time, the accepted world-wide pattern for lease sales.

This new twist to leasing came up at a hearing during which it appeared almost certain the commission would announce plans for a January lease sale of four tracts covering 17,000 acres off Santa Barbara County. The tracts, located in the area where the last state leases were issued, are considered the top wildcat acreage in the California tidelands.

When the meeting opened, staff members hung a map showing the four prospective parcels. The commission was near the end of discussion on the lease when the parcel-at-a-time idea was injected into the meeting.

Richard Richards, a Los Angeles attorney representing Pauley Petroleum, Inc., came up with the single-tract leasing proposal. He argued that this is the best way for the state to get the most money from its potential oil lands offshore.

Richards, a state senator, made his proposal while protesting the commission's plans to prohibit conditioned bids at the next sale. He pointed out that at the 1958 sale the commission permitted Pauley and associates to submit the same bid on two separate parcels with the condition that if the group lost one bid, the money would apply to the second parcel. The Pauley group won two tracts in 1958, both on conditional bids.

The commission had decided to prohibit conditional bidding at the next sale after the attorney general's office ruled such bids are "not free from legal doubt."

As a result of Richards' protest, the commission decided to delay its decision to hold a lease sale on the four tracts and meet November 15 in Sacramento to decide two questions: Will parcels be offered one at a time and will conditional bids be accepted?

All three members indicated they favor offering one tract at a time, but Commissioner John Carr came out flatly against conditional bids.

Oilmen unhappy . . . Many of the oil men attending the hearing expressed their dissatisfaction over the prospect of bidding on one tract and over conditional bids, but none protested during the hearing.

All three commissioners indicated they agree with Richards that offering just one tract would result in companies' laying more money on the line than if several tracts were offered.

But one leading West Coast oil man whose company has been active in the offshore lease play said he doubts his company will spend any more money on the one-shot basis.

"We evaluate each tract and base our bid on the reserves evaluation. There is no cushion; no gamblers'

California Royalty Rate for Offshore Production

Production	Royalty (%)
100 bbl. daily	16.66
150 bbl. daily	23.07
200 bbl. daily	28.57
250 bbl. daily	33.33
300 bbl. daily	37.50
350 bbl. daily	41.17
400 bbl. daily	44.44
450 bbl. daily	47.36
500 bbl. daily	50.00

California's sliding-scale royalty for offshore oil is pegged to a minimum rate of 16.66% for wells making 100 bbl. daily or less. The maximum rate of 50% covers wells making 500 bbl. or more a day. Payment is based on the highest price paid for oil of like quality in the nearest field.

money. I doubt that we would have spent any more money had the tracts been put up singly," he said.

Another oil man expressed serious doubt his company would participate in a one-tract lease sale.

What was learned . . . While the meeting didn't turn out as expected, it did give oil men some idea of what land will be offered by the state.

The lease sale as originally scheduled would have included four tracts of 4,250.14 acres each. Two of these tracts cover the area between Blocks D and E, which were leased in 1958. Another is just west of E and the fourth is just east of D.

The commission, if it goes the single-tract route, will offer one of these four tracts. The tracts would probably be offered on 60 or 90-day intervals with the first offering in February.

Block D brought an all-time high offshore bid of $23.7 million at the 1958 sale. Texaco Inc., Monterey Oil Co., and Newmont Oil Co. are developing the tract with a 28-well platform.

Block E is one of the tracts awarded the Pauley group. It brought a top bid of $5,100,000. The Pauley group includes 39 individuals and companies, including Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc. A drilling platform is scheduled to be moved to the parcel soon.

The new tracts outlined by the state are slightly larger than the old tracts, since the seaward boundary is set at 3 nautical miles rather than 3 statute miles. The old tracts cover 3,840 acres compared with 4,250.14 for the new ones.

The royalty rate set for the next sale is the same as the 1958 rate. It ranges from a minimum of 16⅔% for a well making 100 bbl. daily or less, to a maximum of 50% for a well making 500 bbl. or more daily.

Spacing requirements in a new lease form were changed slightly. Twenty-acre spacing is prescribed for oil production down to 6,000 ft. and 40-acre spacing for deeper production. Under the old leasing terms, the wider spacing began at 8,000 ft. rather than 6,000. Spacing for gas wells has been set at 320 acres for any depth.

The commission also announced it is withholding further leasing between Gaviota and Elwood, two coastal towns in Santa Barbara County, until a further study of platform restrictions is made. Under present rules, no drilling is permitted within 0.8 mile from shore.

Revising the platform restrictions could raise a problem, since moving the drilling line further out to sea would put the platform in water several hundred feet deep in some spots.

watching WASHINGTON

Clyde La Motte

• Import controls will inevitably become tighter . . .

CHANGES in oil-import rules currently being considered by Interior Department and the Administration should serve as a further indicator to the industry that import restrictions are going to continue to tighten.

Certainly there is nothing in sight to suggest that there will be any easing of these controls.

For the most part, the tightening process is likely to be a gradual one. For instance, the present proposals would amount to a "reduction" of around 60,000 bbl. daily. This will be no big boon to producers nor will it be a seriously crippling blow to importers.

In the long run, however, an accumulation of such reductions will constitute an increasingly important factor. And the tighter the restrictions become, the less it is likely they can be abandoned.

In other words, the industry can count on living with import controls indefinitely.

• Cut in "historic" quotas may be next step . . .

SPECULATION has already cropped up that one of the next major changes will be to reduce or eliminate the "floor" now provided for historic importers. All quotas would then be assigned solely on the basis of refinery runs.

No such move is currently being contemplated at Interior, but it is a good bet that it will be given consideration in the months ahead.

If such a step is taken it will probably be a gradual, graduated reduction of the percentage provided for historic importers—those with a record of imports in the base year, 1957—rather than any outright elimination of the entire percentage factor.

In such an approach, the historic percentage would be whittled down in successive steps covering a year or two—or even longer.

There are two principal reasons why the present formula for historic importers will likely be changed.

For one thing, the further we get from the 1957 base year, the less apparent reason there would be to "protect" the status of importers of that year.

Furthermore, if there is logic in the argument that companies who went abroad prior to 1957 and developed oil sources are more deserving of an import quota than a domestic firm which risked nothing abroad, then similar consideration would seem valid for companies that have gone abroad since 1957.

• Aim of controls: To prevent further erosion . . .

WHATEVER CHANGES are made in the imports program, it should be borne in mind that the domestic producer is not going to reap any big windfall.

Rather, the principal apparent aim of the control program is not to improve the status of the producer but simply to keep his plight from worsening.

For example, the changes now under consideration are not likely to result in any significant drop in imports. Rather, they are to keep imports from rising as rapidly as they would under the old formula.

Thus, the producing segment cannot expect that conditions are going to improve greatly—at least not as a result of the import-control program or any changes made in it.

One other factor of life to keep in mind is that, as long as the Government is involved in major matters affecting the industry, there is an inherent danger that politics will play a part in governmental decisions.

There are skeptics now who have raised an eyebrow over the timing of the changes currently proposed. They wonder how much politics got involved in the decision to propose the import changes a scant 10 days before a presidential election. Was the situation so serious that action could not have been delayed until after November 8?

Drillers take the offensive:

Contractors Move to Get A "Fair" Deal from Companies

THERE is growing grumbling among drilling contractors that producers are making too much hay out of the present buyers' market in the drilling business.

Producers have been benefiting from bargain-basement footage prices for several years due to the severe competition stemming from too many rigs and too few holes.

Not content with this, the contractors contend, producers generally are applying heavy pressure for added concessions which cut still deeper into already dangerously skinny profit margins for the rig operator.

The effect on the contractor of submitting to such operator demands has been to hike the driller's costs—or to greatly increase his risk with no added compensation.

Now, it appears, the men who drill the wells may be getting ready to buck.

AAODC acts . . . Late last month, the American Association of Oilwell Drilling Contractors curtly announced the formation of a new permanent committee on "Sound Practices."

The new committee, AAODC said, would take steps to deal with problems arising from the "increasing frequency with which undesirable and inequitable conditions are being imposed on drilling contractors."

Heading up the committee as chairman is William P. Clements, Jr., president of Southeastern Drilling Co., Dallas. Serving with him will be: Jack Abernathy, Big Chief Drilling Co., Oklahoma City; R. C. Tucker, Great Western Drilling Co., Midland, Tex.; Mark Gardner, Delta Drilling Co., Tyler, Tex.; and Max E. Peden, True Drilling Co., Casper, Wyo.

General rebellion? . . . Generally, according to the AAODC board of directors, the committee will work to persuade producers not to insist on contract conditions which impose on contractors "unreasonable risk of financial loss."

And, on the other hand, it will encourage contractors not to accept contracts containing such conditions.

Just how the committee will go about accomplishing its chores is not yet clear. And informed sources indicate that specific plans await further meetings of the committee.

Risks, costs up . . . Neither has the committee or the AAODC board disclosed as yet the conditions being imposed by operators that contractors are finding so unpalatable.

There are several practices, however, which have developed over a period of months, that contractors have criticized loudly. Almost certainly these will be scrutinized by the sound-practices group.

Most of them involve added risk without added payment.

The day-work question . . . Contractors complain that some operators in South Louisiana are insisting that the point at which a project goes on day work be set back. Where contracts formerly were pegged to go on day work at 11,000 to 12,000 ft., some operators now demand that footage rates prevail until hole depth reaches 14,000 ft.

And where the switch to day work is based on mud weight, some operators now demand that it not take place until mud weight reaches 14 lb., as against 12½ lb. not so long ago.

A contractor who feels he must accept such conditions, drillers complain, is assuming an awful risk—especially if he is not thoroughly familiar with drilling conditions in the immediate area of a prospective well. South Louisiana is noted for hazardous pressures at depth.

The speed hazard . . . Contractors are concerned, too, about the current drive by producers—especially offshore—for record-breaking penetration.

Some operators, they complain, are demanding abnormal drilling speed but are unwilling to pay more for the added strain and wear on the rig or to protect the contractor adequately against the more frequent, costly fishing jobs.

There is no compensation either, in some cases, for the extra-heavy equipment that such drilling demands.

Drill pipe and slant holes . . . Operators are doing more and more directional drilling.

But they are not willing to pay extra for the added wear on drill pipe—a costly item in drilling. Going on day work when a whipstock is set is a generally accepted practice. But, some contractors complain, the rates are not high enough to counter the added risk in drilling such a hole.

The third-party issue . . . Not risky but worrisome to contractors is the growing operator trend to make the contractor pay third parties for services and supplies formerly paid for by the operator.

This often works a hardship on the contractor. It requires a lot of capital. And the operator frequently is slow in reimbursing him after the well is finished.

One operator, it is reported, cur-

PROCESSING

A phthalic anhydride plant with a capacity of 30 million pounds a year will be built by Witco Chemical Co. at an East Coast site. Scientific Design Co. will handle engineering and construction.

A new process furnished by Shell Development Co. will be used in a polypropylene plant to be constructed by Shell Chemical Co. near Woodbury, N. J. Capacity will be 80 million pounds a year. Besides the plant, a research and technical service center will be built to provide data on new uses and new grades of polypropylene.

A catalytic muffler designed to help control smog will be manufactured and marketed by Universal Oxidation Processes, Inc., Los Angeles, after the product is certified by the California Motor Vehicle Pollution Control

rently is writing into the contracts a proviso that the contractor will not be paid for a drilling job or reimbursed for paying third parties until 150 days after the well is completed.

And some large operators, informed sources tell the Journal, are now considering requiring a contractor to put up bond to guarantee that his suppliers will be paid.

This would protect the operator against any possibility of a disgruntled supplier obtaining a lien on a well drilled by a contractor. But from the contractor's standpoint, it would add still more weight to the growing cost burden he must carry.

Contractors chafe, too, at the growing trend of operators to insist on including "waiver of subrogation" and "hold harmless" clauses in their contracts.

These absolve the operator from any financial responsibility for loss—say, to a service firm's equipment—and transfer this monkey to the contractor's back.

Some operators, contractors say, are dictating drilling conditions in such a way as to add to contracting costs without good reason.

In West Texas, for instance, they contend contractors sometimes are not allowed to use water as the drilling fluid in drilling through salt. This not only cuts way down on the penetration rate (thus adding to labor, fuel, and other costs) but also adds heavily to his drilling-fluid outlay.

These are some of the problems which AAODC's new sound-practices committee probably will attempt to alleviate.

Coal-Slurry Pipeline Nearer

. . . to reality as Texas Eastern names vice president to steer negotiations. Line would move West Virginia coal.

A $125-MILLION-plus pipeline project for transporting coal in a slurry is moving closer to reality.

Texas Eastern Transmission Corp., Houston, last week was so confident the pipeline is a sure thing that it elected a new vice president to supervise the project.

Texas Eastern was not ready to announce financing plans, but it conceded that a man of vice presidential stature is required to handle the negotiations which precede building of the line.

The new vice president is W. T. Thagard, manager of Texas Eastern's coordinating and planning department.

Texas Eastern is working jointly with Consolidation Coal Co., Pittsburgh, to put together the pipeline project to move West Virginia coal some 350 miles to electric utility companies in Pennsylvania, New Jersey, and New York. The cost, including the coal mine, would run to $125-$150 million.

For more than a year the two companies, operating on a 50-50 basis, have negotiated with utilities to purchase the slurry coal for use in generating electricity (OGJ, Oct. 12, 1959, p. 92). Texas Eastern hopes construction can start next year and be completed in 1962, although Consolidation fears this timetable may be unrealistic.

Consolidation presently operates the only coal pipeline in existence—a 10-in., 110-mile line from Cadiz, Ohio, to Cleveland. The proposed line would be 24-in. and would move over steeper grades.

THAGARD

Thagard's new duties as a Texas Eastern vice president will be to direct and expedite the company's field projects of carrying coal by pipeline. Since 1955 Thagard has been in charge of the company's studies in "logical diversification" and has worked closely with the coal project since its inception.

Before coming to Texas Eastern, he had a career closely associated with public utilities. A chemical engineering graduate of Rice University, he worked several years as an engineer and executive with Atlanta Gas Light Co. During World War II he was a utilities advisor with the Allied Military Government in Europe. Following the war he was a rate consultant for gas and electric utilities in New York until joining Texas Eastern in 1947 as an administrative engineer.

BRIEFS . . .

Board. The company is a newly formed subsidiary of Universal Oil Products Co., Des Plaines, Ill. Purzaust, one of several anti-smog devices being studied by the board, contains a catalyst for converting smog-causing components in exhaust gases into non-irritating compounds.

The name of Republic Oil Refining Co. at Texas City has been changed to Plymouth Oil Co., Republic division. The switch stems from Plymouth's plans for reorganization and movement of the company's operating headquarters from Pittsburgh to Houston. For the past 3 years Republic Oil Refining has operated as division of Plymouth Oil, and before that it was a separate corporation.

A gas-processing and sulfur-manufacturing plant will be built by Shell Oil Co. of Canada in the Pincher Creek district of southern Alberta. The $20,000,000 plant is designed to deliver initially about 100,000 M.c.f. of residue gas daily to Alberta & Southern. It will produce 1,000 tons of sulfur daily and about 3,500 bbl. of liquid products. Completion is expected by the end of 1961.

Crude capacity at British American Oil's Calgary refinery has been boosted from 7,500 to 10,000 bbl. per stream day with the completion of a $1.5 million expansion program. Largest new addition was a naphtha desulfurizer with a capacity of 3,500 bbl. daily.

Construction and engineering contract on a $4 million carbon-black plant at Bakersfield, Calif., has been awarded by Continental Carbon Co., Houston, to Ralph M. Parsons Co., Los Angeles. Work will be completed by early summer.

Also for Refiners . . .

IN THE NEWS: First 9 months' refinery runs stay close to 1959 levels (p. 91) . . . Du Pont survey shows motorists are watching their pennies closer when buying gasoline and oil (p. 92) . . . California Standard puts part of new Hawaiian refinery on stream (p. 109) . . . Proposed changes in resid-import plan draw criticism (p. 107) . . . Journal study shows refinery runs trimmed slightly more in Southwest during September than in other areas (p. 112.)

PLUS THESE TECHNICAL REPORTS: Here's where we are on gas engines (p. 129) . . . Photography is a good maintenance tool (p. 147).

Natural-Gas Volumes, Revenues Set Records

THE natural-gas industry's volume of business, gross revenue, and net income last year topped all previous records.

Gas prices also showed a gain. But the whole story isn't that optimistic. Profits, as a per cent of gross income, slipped again.

The industry's fantastic growth shows up in a comparison of gross revenue for 1959 with that of 10 years earlier. Last year's revenue was $3,098,659,000. In 1949 it was $549,576,000. That's a phenomenal 464% increase.

Dollar volume increased in that decade much faster than product volume. Last year's sales were 9,368,515 million cubic feet. Ten years earlier they were 3,176,123 million cubic feet. This is an increase of 195% in the 10-year period.

Thus, while volume of business almost trebled in 10 years, gross revenue increased more than 5.5 times. The faster gain in revenue was due to the steadily increasing price.

An impressive figure in the 1959 report of expenditures was the total spent on "nonproductive well drilling." It was $13,764,000, the highest on record. For the 3 years ending with 1959, the average spent annually on nonproductive well drilling was $13.3 million. It was $7.2 million in the preceding 3 years and $3 million in the 3 years before that.

How the gas industry has grown

	1959	1954	1949
Sales (million cubic feet)	9,368,515	6,280,611	3,176,123
Average sales price (¢/Mcf)	31.15	24.72	16.61
Gross revenue ($1,000)	3,098,659	1,620,606	549,516
Net income ($1,000)	292,323	168,440	78,329
Return on gross (%)	9.43	10.39	14.25
Expenditures ($1,000):			
Production	1,683,425	815,284	242,955
Storage	13,576	7,869	1,225
Transmission	248,844	140,186	63,795
Other	145,851	82,364	34,069
Total	2,081,696	1,045,703	342,044
Total assets ($1,000)	11,422,131	7,786,327	3,529,890
Miles of pipeline:			
Field	40,913	34,456	N.A.
Transmission	128,281	105,639	N.A.
Storage	2,847	2,060	N.A.
Total	172,041	142,185	

No Decision Near on Montreal Pipeline

THERE WILL BE no snap decision on the Edmonton-Montreal oil pipeline issue, Trade Minister George Hees said in Ottawa last week.

"This is a very complicated matter," Hees added in an interview. "We are working on it as a matter of urgent concern, but it's going to take time."

He refused to set a date for a decision. Later, other government officials said there is little possibility of an oil-policy statement until after the start of the year.

After taking over as minister last month, Hees conferred on the pipeline issue several times with members of the National Energy Board and other officials.

His flat remark about going slow on the matter knocked down rumors that a decision was imminent.

Almost every department of government is caught up with the delicate problem of Canadian oil marketing. The oil industry itself is divided, with the independent producers demanding immediate government action to facilitate pipeline construction and the majors opposing them.

It is generally agreed that an Edmonton-Montreal pipeline is impractical without stringent government controls to slow down or halt the importation of crude from Venezuela and the Middle East.

The External Affairs Department is opposed to any move that would interfere with the friendly relations existing between Venezuela—one of the most influential of South American nations—and Canada.

On the other hand the Trade Department, attempting to grapple with Canada's chronic imbalance of international payments, would like to reduce the deficit by halting the importation of foreign crude.

Alaskan Wildcat Dry

Union Oil Co. and Ohio Oil Co. have abandoned their wildcat program in the Knik Arm area of Alaska after drilling a second dry hole.

The two wells were drilled about 18 miles northwest of Anchorage in an area where several other wells have been drilled without finding commercial production. The second well, Knik Arm 2 in Sec. 5-16n-3w, was abandoned at 3,215 ft.

The two companies hold about 229,000 acres in this section of Alaska (OGJ, Oct. 10, p. 114). The rig that drilled the two dry holes has been moved to Canada, but the companies may go back into the area later.

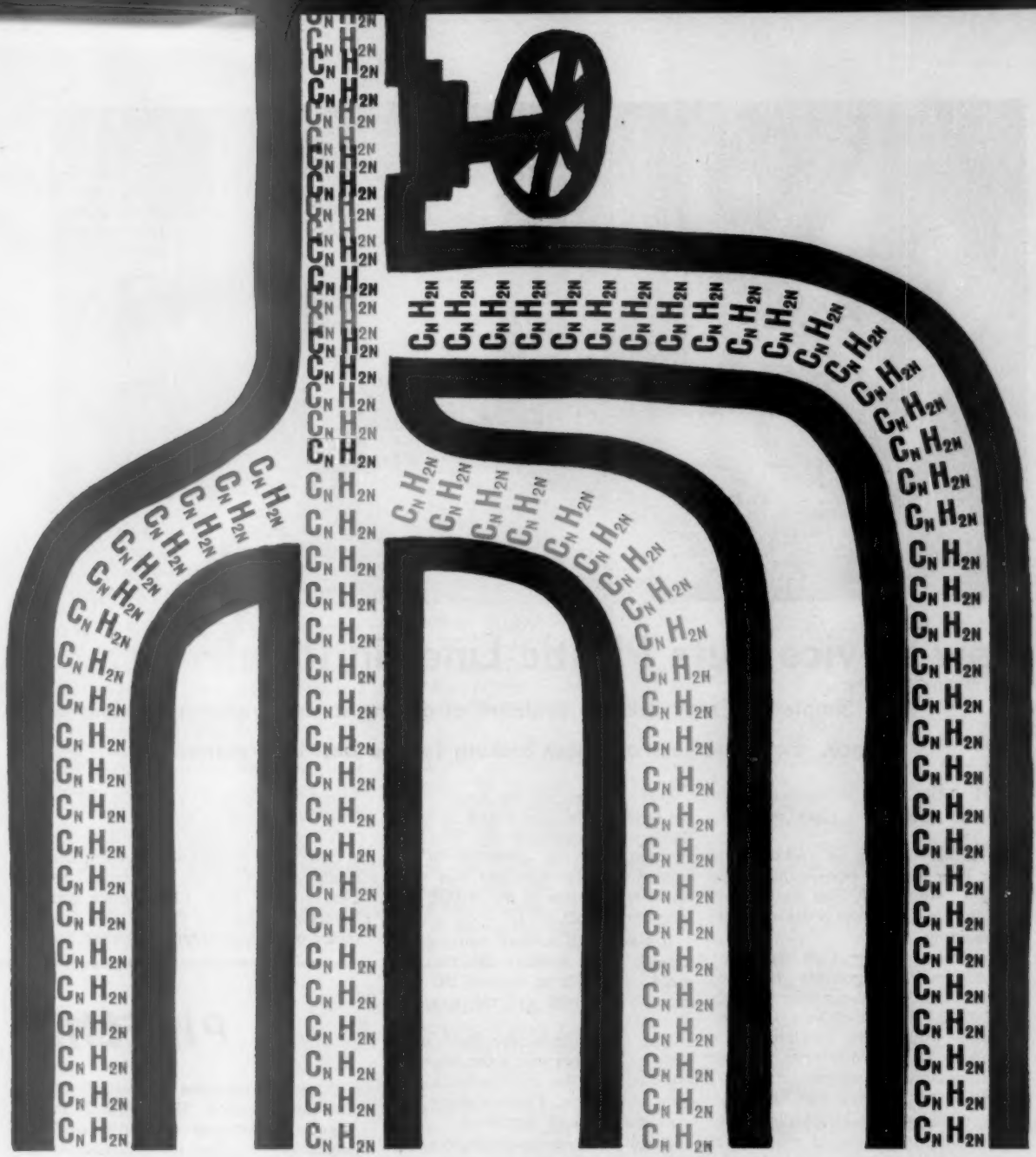
Proration Ended

. . . in Mississippi as Esso restores old 15% cut.

ESSO STANDARD division of Humble has restored a 15% cut made 8 months ago in Mississippi crude purchases.

The restoration means Esso will take about 9,000 bbl. daily of additional light crude in Mississippi. The company declined to state what its total purchases are in the state, although they would appear to be about 60,000 bbl. daily if 9,000 bbl. is 15% of the total.

Esso, the largest buyer in the state, was the only one to prorate in Mississippi. The crude goes to Esso's Baton Rouge refinery. The company declined to state why it was restoring full buying but warned that "it may be necessary to reinstate this or a similar proration at some future date."



Need olefins? Any olefins? Talk to Gulf!

Gulf is already a major ethylene supplier—over two billion pounds in seven short years. This is the keystone of Gulf's basic olefin experience.

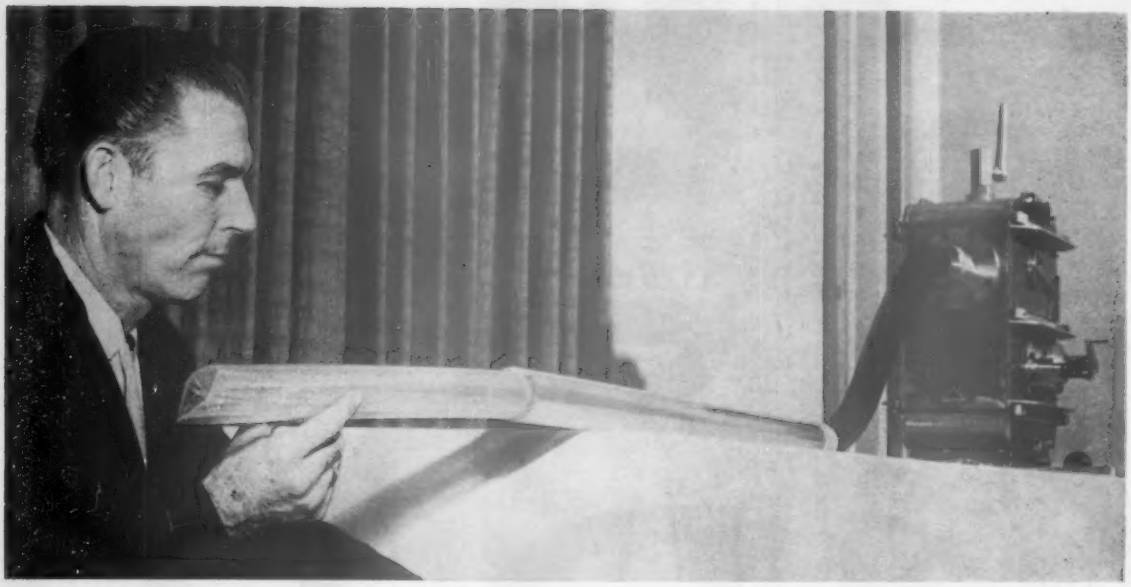
Currently we're also supplying merchant propylene, heptenes, nonenes and dodecenes. And if you require other olefins, we can make them for you. We have top technical service people . . . and facilities for making highest purity material (our ethylene is running 99.8% minimum). And you can be sure of dependable supply.

Let's discuss your requirements. Write or call Petrochemicals Department Sales Office, Gulf Oil Corporation, 360 Lexington Avenue, New York 17, New York.

Quality Petrochemicals to Begin With

Benzene • Cyclohexane • Ethylene • Isooctyl Alcohol • Propylene • Propylene Trimer and Tetramer • Sulfur • Toluene

GULF



New Device Puts Plastic Liner in Pipeline

• Simple unit may lick the problem of getting a liner inside a pipeline in place. Experimenters are now looking for the best liner materials.

THE PROBLEM of internally protecting a pipeline in place may be close to solution.

A device capable of installing a plastic liner inside a pipeline has been invented. Apparently the major remaining unsolved aspect is the material for the lining.

The device, known as an interliner, was demonstrated publicly for the first time at the Tulsa conference of the National Association of Corrosion Engineers. Among the hundreds who witnessed the demonstrations were several oil-company representatives interested in booking the unit for tests.

One test is tentatively scheduled for a corrosive-product line in a refinery; another for a salt-water disposal well.

These proposed tests illustrate the potential versatility of the interliner.

How it works . . . It is extremely simple in design. It takes a spooled, tubular, flexible plastic liner and, with a fluid as the driving force, unrolls the liner through the pipe.

Since it is done at low pressure, there is little danger of breaking the lining. And, since it is unrolled within the line, very little friction is involved.

Richard V. Harper and Lawrence B. Wilder of Pan American Petroleum Corp. are the inventors. Manufacturing rights have been assigned to Perrault Interliner Co., which made the first working unit.

One evidence of the simplicity of the device is the time it took to manufacture and assemble the first one. Perrault got the go-ahead in late September. The first unit was ready for demonstration at the NACE conference October 25-27.

It consists of a small housing with several ports, a shaft for the liner spool, and dials to register the pressure of the fluid and the length of the liner used.

One port admits the fluid under pressure, another ejects the liner into the pipe, and the third is for a pressure relief valve. Fluid pressure controls the speed of operation.

A simple 1.5-mil polyethylene liner was used in the demonstration at the NACE conference, with nitrogen as the expanding fluid. Despite its lack of strength and its vulnerability, the polyethylene liner was extended for several hundred feet in demonstrations. Plastic manufacturers are being consulted about the use of stronger material for ultimate use.

It is probable that a variety of materials will be used for liners. It is believed that it will be possible to adapt a specific plastic to a specific use so that the best results will be obtained.

Nitrogen was used as the expanding fluid in the Tulsa demonstrations because of safety and convenience. Other fluids can be used and would be preferred in actual service. They could include water, oil or air.

The first unit handles the liner for a 2-in. line. By simply changing the discharge unit, it can be adjusted to 3-in. or 4-in. lines. Larger units will be capable of lining pipe of any diameter used in producing, pipeline, or

PIPELINE

Operating revenues of natural-gas pipelines totaled $260,791,622 in August, an increase of 17.4% over August 1959. For the 12 months ending August 31 the lines had operating revenues of $3,451,442,946, an increase of 17.5% over the preceding 12 months; sales to consumers were up 10.5%; sales to other utilities rose 18.5%; and other revenues were up 20.4%. Biggest dollar increase came in sales to other utilities, a gain of $435,926,197. The companies' total investment in facilities rose to $9,360,-203,115, up 7.6%.

Net deliveries of oil by Canadian pipelines totaled 25,437,917 bbl. in August, up 126,688 bbl. from August 1959. For the first 8 months of this year, deliveries were 213,442,144 bbl., an increase of 4.3% over a similar period in 1959.

processing operations. Since liners are likely to be expansible, they should be smaller than the line that is to be protected.

Perrault does not intend to market the device. Instead it plans to lease it either on the basis of time in use or footage installed.

Baytown Voting Set

...to let workers rule on union affiliation

PRODUCTION and maintenance workers at the Baytown, Tex., refinery of Humble Oil & Refining Co. will vote November 10-11 whether to return to the Baytown Employes Federation or remain in the Oil, Chemical, and Atomic Workers Union.

The two unions agreed on the election date without argument after the independent BEF had filed an election petition bearing signatures of more than 30% of the 2,750 production and maintenance workers at the plant (OGJ, Oct. 10, p. 112). OCAW won the bargaining agent rights from the BEF in August 1959.

The election also will cover 350 technical workers still represented by the BEF. The technicians will decide which union they want and also whether they want to be included in the same bargaining unit with production and maintenance workers.

Both unions want to start bargaining for a wage increase soon. The OCAW has a nationwide program for an 18-cent increase.

Resid-Import Plan Draws Fire

OIL IMPORT Administration officials have received more than 50 comments—some quite heated—on the proposed changes in residual fuel oil import rules designed to make some "newcomers" eligible for import quotas.

The deadline for comments has passed, and it is anticipated that Interior Department will make its decision within a few weeks.

Many of the comments, particularly those from New England industrial consumers, were aimed primarily at seeking an increase in total residual-fuel import quotas. Interior officials say such suggestions will be considered apart from the proposed rule changes.

Other comments, however, were directed specifically at the proposals which would permit assignment of newcomer quotas based on deep-water-terminal input.

The most voluble complaint was that the proposed changes do not eliminate the "captive customer" problem.

A dissatisfied group has argued all along that a buyer without a quota is tied to the importer with a quota, and is thereby unable to shop about for a supplier offering a lower price.

This group maintains that this situation will continue even though a newcomer will now get—if the proposed rule is adopted—a quota to fill part of his supply needs. The reason: The supplier will insist that the newcomer buy his quota from him or he (the supplier) will refuse to provide the remainder of the residual fuel the newcomer will need.

Otis Ellis, general counsel of the National Oil Jobbers Council, made a major point of this in a sharply critical letter he wrote to the President and to the Oil Import Administrator.

He proposed a substitute plan which would be based primarily on cargo purchases of imported fuel oil made by a terminal operator in the base year, whether or not the buyer was the importer of record.

This, Ellis argued, would help maintain the competitive pattern that existed before the control program was put into effect.

Ellis conceded that this would leave unsolved the problem of the smaller purchasers (those buying less than cargo lots). But, he said, it would at least be a step in the right direction.

Ellis also criticized the quarterly assignment of residual-fuel import quotas because he feels that longer periods would be more feasible. And he found fault with Interior's definition of deep-water terminals.

Interior said it had the suggestions of Ellis and others "under consideration," but indicated that the arguments were not new to import officials.

BRIEFS . . .

Three new terminals of the Mid-America LPG pipeline have been placed in operation. Truck-loading facilities at Greenwood, Neb., Sanborn, Iowa, and Kearney, Mo., have been opened, and tank-car-loading facilities are being readied. All but 90 miles of the 2,180-mile system from West Texas to Minnesota is finished.

Tentative FPC approval has been granted to Transcontinental Gas Pipe Line Corp. for construction of 77.3 miles of 30 and 36-in. loops and for the addition of a total of 25,040 hp. in eight compressor stations. The $15,800,000 program involves facilities in Texas, Louisiana, Mississippi, Alabama, South Carolina, North Carolina, Virginia, and Maryland.

El Paso Products Pipeline Co. will build a 32-mile, 6-in. crude oil line from Patrick Draw field in Wyoming's Sweetwater County to connect with Service Pipe Line Co. near Wamsutter, Wyo. This is the second new Wyoming line to tie in with the Service system. The other is the proposed Teton line from Barber Creek and Dead Horse fields to Midwest.

FPC approval is being sought by Texas Gas Transmission Corp. for construction of 146 miles of pipeline and the addition of 4,000 hp. in compressor capacity at a total cost of $16.8 million. The program calls for loops at points in Kentucky, Tennessee, Mississippi, Louisiana, and Indiana, and 50 miles of 16-in. and 8-in. lines to connect five fields in Terrebonne Parish, Louisiana.

A 190-mile extension of the former Oil Basin pipeline from Glendive, Mont., to Minot, N. D., has been completed by Cenex Pipeline Co., a subsidiary of the Farmers Union Central Exchange of South St. Paul, Minn. The 8-in. line, with a capacity of 15,000 bbl. daily, will connect with the new Cenex terminal at Minot.

Also for Pipeliners . . .

IN THE NEWS: Government still expanding its system of product pipelines to air bases (p. 97) . . . Serious negotiations will start soon on coal-slurry pipeline (p. 103) . . . Natural-gas industry again sets new records in volume and revenues (p. 104) . . . The much-talked crude line from Alberta to Montreal still has not received a decision (p. 104) . . . New device will put a plastic liner inside an existing pipeline (p. 106).

PLUS THIS TECHNICAL REPORT: Gas hydrates: A practical control method (p. 166).

CLEAN JET FUEL is essential to safe jet aircraft operation. Today, all aviation fuels in current service may be provided the ultimate protection against fuel contamination. The new Warner Lewis 2-stage separator/filter eliminates jet fuel contaminants — free water and dirt. This new equipment developed by Warner Lewis Company, pioneer manufacturer of separator and filter equipment for aviation refueling, delivers the cleanest fuel ever demanded by commercial or military aircraft. A Silent Servant of Safety, this equipment is installed at the fixed facilities and on refueler trucks and hydrant carts serving most of the world's major airports. It is approved and in production for the U. S. Air Force under recent contracts. For further information, write Aviation Products Division, Warner Lewis Company.

WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

SILENT SERVANT OF SAFETY

WARNER LEWIS PROTECTS THE JETS

DIVISION OF FRAM CORPORATION
IN CANADA: FRAM CANADA, LTD., STRATFORD, ONTARIO

Hawaiian Refinery Goes on Stream

• Standard of California's plant on Oahu is first major refinery in the mid-Pacific. It will process Sumatra, Saudi Arabia crude, produce 21 products.

THE NATION'S newest state, Hawaii, can lay claim to owning the oil industry's newest refinery, a 35,000-bbl. plant built by Standard Oil Co. of California.

The first units at the plant went on stream last week with directors of Socal on hand for the occasion. The plant is the first major refinery in the mid-Pacafic and gives Standard of California the jump in supplying the growing demand on the islands.

The refinery is designed to turn out a wide range of products which would meet any type of demand.

All told, 21 products will be produced. These include three grades of motor fuel, four of aviation gasoline, two of jet fuel, two of light diesel fuel, and four grades of asphalt and heavy fuel oil. The refinery will also produce some LPG and a special weed killer tailored to meet the island's agricultural demand.

Last week's valve-turning was restricted primarily to the crude unit and auxiliary equipment. Most of the downstream processing units are still under construction and not scheduled for completion until mid-1962.

These downstream units include a 13,000-bbl. fluid cat cracker with a recycling capacity of 13,000 bbl.; a 3,800-bbl. alkylation unit; a 1,350-bbl. isomerization unit; and a 500-bbl. asphalt plant.

The refinery is located on a 300-acre site on Barber's Point, which is on Oahu Island about 20 miles from downtown Honolulu. Construction began in 1958. Bechtel Corp. and Hawaiian Dredging & Construction Co. got the contracts to build the plant.

Supply and markets . . . The new plant will process Sumatran and Arabian crude delivered by supertanker.

Above-normal crude storage is provided at the plant to guard against a shutdown resulting from a delay in tanker shipments. The storage totals 1¼ million barrels and includes five 242,000-bbl. floating-roof tanks.

Tankers arriving at Oahu feed crude to the plant through an offshore loading terminal. The terminal is connected to the plant with a 30-in. underwater line which runs 12,000 ft. offshore.

One of the problems in building the plant was blasting through underwater coral while laying the offshore crude line.

Standard of California has a sizable marketing operation in Hawaii to serve both the motor-fuel and aviation-gasoline field. There are 158 independent Chevron dealers on the islands. And the company has supply contracts with several airlines which call for 50 million gallons of avgas and a growing quantity of jet fuel yearly.

Louisiana Formula Praised

. . . as "milestone." Conservation chief says forthcoming order will definitely bring well spacing into picture.

CONSERVATION Commissioner James H. Gill of Louisiana said last week that Louisiana definitely will change its allowable formula to make well spacing a factor. But the final order is not yet ready for release.

Gill described the proposed order as a "milestone" in Louisiana's conservation history. He spoke to the Houston chapter of American Petroleum Institute's Production Division.

The conservation department has a prepared preliminary order which would base allowables 50% on acreage and 50% on the well in future pools (OGJ, Oct. 3, p. 54). But the final draft of the order has been held up for several weeks.

At a hearing in late September, major companies generally favored making acreage a more important factor, while land owners feared any change from the present allowable formula based solely on well depth.

Gill said that for several years Louisiana has believed its spacing regulations — generally for 40-acre spacing—have not given sufficient incentive for optimum distances between wells.

The new order, he said, has the double purpose of helping to encourage drilling of deeper, riskier wells at lower cost and of limiting the number of producing wells from known reservoirs. Limiting production will relieve an overcrowded crude market.

Tom Winfiele, chief engineer for the conservation department, answered some pointed questions from the API members following Gill's address.

Winfiele said the proposed order, while applying principally to new pools, will recognize wider spacing in pools established as far back as last May 24 if the producers can supply evidence justifying the higher allowable.

Asked whether the new formula would apply to 80-acre spacing in pools established prior to May 24, Winfiele replied that the conservation department first wants "to get a little experience with the strictly new pools."

In general, however, he said Louisiana "wants to make it interesting" for Texas operators to spend their money in Louisiana—"and we think this order will help."

Winfiele ducked a touchy question on whether regulatory agencies of such leading oil states as Texas and Louisiana should try to "get together" in controlling production and thus prevent excessive crude runs in areas larger than a single state.

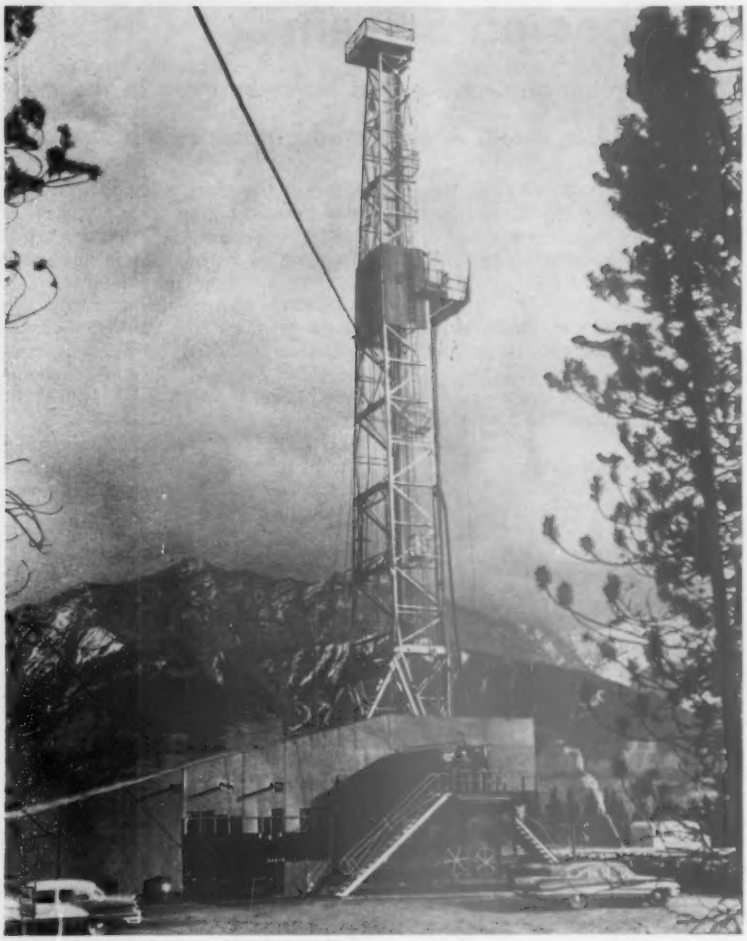
Gill also said in his address that secondary recovery is gaining importance in Louisiana. The state has pressure-maintenance projects in 143 reservoirs in 69 fields, and these will recover ultimately an additional 895 million barrels of oil.

Tanker loses license for Cuban delivery

A 24,830-dw.-ton tanker has lost its registration in an unprecendented action taken by the Liberian Government after the ship carried Russian oil to Cuba last month without prior clearance.

The Greek-controlled Perseus was stripped of Liberian registry under a 1952 law requiring clearance by any vessel before hauling cargo from a communist port.

Clearance for such voyages has been routine when ship owners sought permission.



TWIN DRILLING titles held by Fording Mountain wildcat.

Canadian Drilling Records Set

. . . by California Standard's wildcat in British Columbia. It holds depth mark and record for open-hole drilling.

CANADA has two new drilling records for total depth of hole and depth of open hole at a Standard Oil Co. of California wildcat in British Columbia.

The new record holder is California Standard D-61-L Fording Mountain, located about 50 miles north of the town of Fernie in southeastern British Columbia. It's about 9 miles west of the Alberta-British Columbia border.

Commonwealth Drilling Co. holds the contract, and its crew last week had taken the well to 16,056 ft. That's 773 ft. deeper than the previous record of 15,283 ft. held by Texaco-Northern Foothills Agreement Group's Simonette River wildcat.

The Fording Mountain test also is reported a record for open-hole drilling. Operator has run 1,069 ft. of 10¾-in. surface casing, leaving the hole uncased for 14,987 ft. to bottom.

California Standard is operating the wildcat as a tight hole and has given no details on possible oil or gas shows. It was spudded on March 15, 1960, and reached the record depth in 228 days of almost continuous drilling.

Indications are the well will not go much deeper with present equipment. Commonwealth's Rig 26, a National 80-B unit, has a rated capacity of only 12,000 ft. using conventional drill pipe.

An unconventional string, however, is being used. About 3,800 ft. of the top string is 4½-in. pipe; but from that point to the drill bit a tapered string graduated from 4½ to 3½-in. diameter is being used.

Only four wells in western Canada have been taken below the 15,000-ft. mark. Besides the California Standard and Texaco-Northern Foothills, the others have been British American 6-4 Lambert Creek at 15,195 ft., and Shell's 6-28-3-30 Waterton test at 15,205 ft.

Shell's deep test was the only successful well of the four.

Prior to the drilling of the Lambert Creek well past the 15,000-ft. mark, the Canadian record had been held by Island Development Co.'s 1 Prince Edward Island in eastern Canada at 14,656 ft. There have been no wells yet drilled past the 15,000-ft. depth in the eastern region.

New Gas Group

. . . formed by Houston men to provide "idea" forum.

A NEW organization, the Natural Gas Men of Houston, has been formed to give employes in the natural-gas industry a forum for exchanging ideas and improving service to the public.

Thirty-five members employed by leading companies constitute the charter group. Membership will be limited to men in responsible positions in all phases of the natural-gas industry—production, marketing, transmission, and distribution.

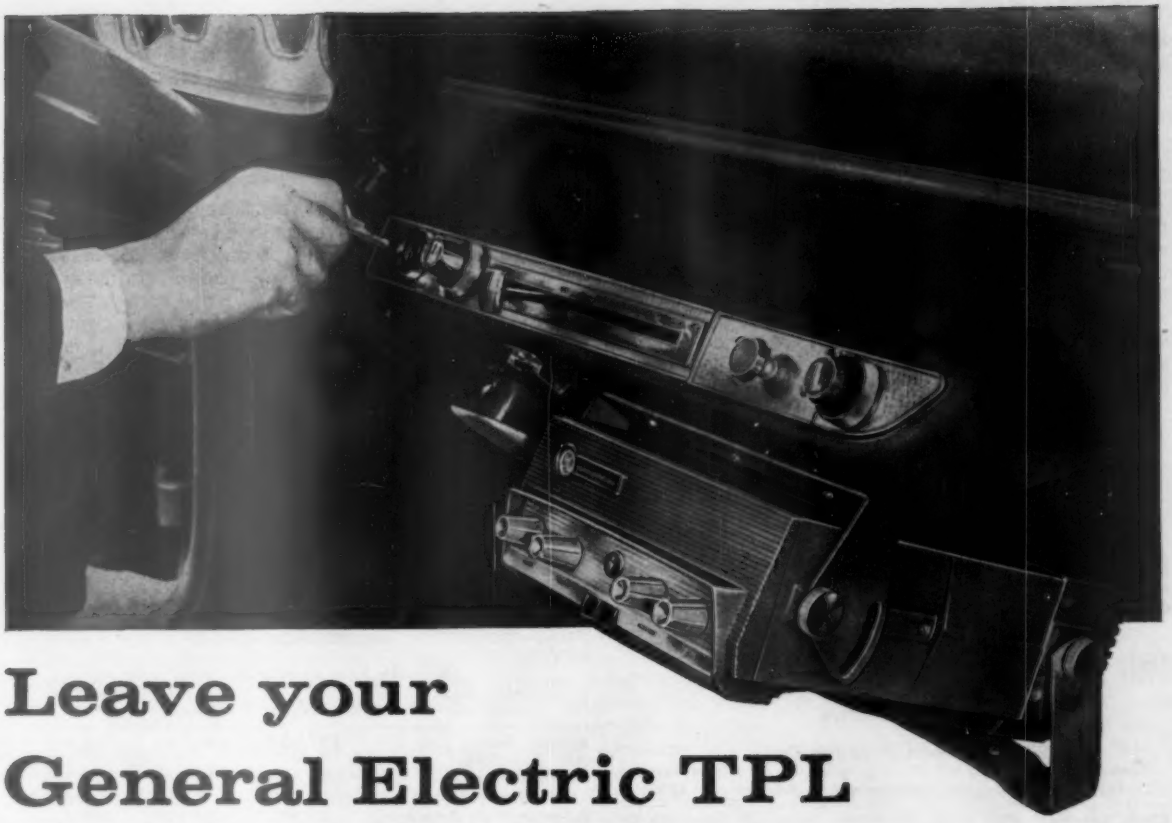
Harold E. Vaughan, assistant to the vice president of Transcontinental Gas Pipe Line Corp., was elected first president of the organization. Quinton S. Drake, Lion Oil Co., was elected honorary president in recognition of his work in helping found the club (for other officers, see p. 224).

Vaughan said the new group was formed "because there are no organizations for gas men here, and we sorely need one." Houston, he said, serves as headquarters for a major portion of the natural-gas industry in the U. S.

While the club will have members in all phases of the industry—"from the wellhead to the burner tip"—many of its charter members are from gas-supply departments. Two or more chapters may be formed for different phases of the industry.

By-laws of the club state that its purpose "shall be to improve the skill and knowledge of the members by providing a forum for free interchange of ideas concerning the natural-gas industry and for the improvement of the service which industry provides the public."

Vaughan said the club "positively is not an organization to be discussing prices" and that the members do not represent their respective companies.



Leave your General Electric TPL 2-way radio on while your engine is off!

LOWEST BATTERY DRAIN AVAILABLE

Other makes of mobile radio drain your battery severely, even on standby. Unless you keep the engine running, this will inevitably shorten the life of your battery. And if you *do* run the engine while your vehicle is standing still, you're letting yourself in for a whole series of other problems—increased gas consumption, increased engine wear, special generators, etc.

Not so with TPL! Standby battery drain on General Electric's new Transistorized Progress Line is so low you need never turn off the TPL unit in your vehicle. By actual measurement, drain is less than 40 milliamperes, or only 1/25 of the current that runs your dome light. And even when the receiver is talking, drain is only 540 milliamperes.

With only four tubes in the TPL transmitter, you require no special generator, use less gas and need fewer engine jobs. The cost of operating your two-way radio system goes way, way down.

Get the full story on TPL—the smallest, most reliable two-way radio you can buy today. Write General Electric Company, Communication Products Dept., Sec. 18110-7, Mountain View Road, Lynchburg, Virginia.

GENERAL ELECTRIC

Journal Study Shows Dip in Refinery Runs

• Throughput in the southwestern states is trimmed slightly more than the nation as a whole in September. Rate is about 85% of capacity.

THE CUTBACK in September refinery runs in the southwestern states was a little sharper than the reduction made throughout the industry in the U. S.

The refineries of Arkansas, Louisiana, Mississippi, Oklahoma and Texas accounted for about 40.6% of U. S. crude runs in September, according to the latest Journal survey of refinery runs. In the previous month the refineries in the five state area had runs equal to 41.7% of the national total.

Nationally, September runs totalled 8,068,000 bbl. daily which was about 2.2% less than the previous month. In the southwestern states runs were 3,274,976 bbl. daily or 4.8% less.

For the nation as a whole runs were maintained at about 82.4% of capacity during September. In the area covered by the Journal survey, which includes all the states where individual runs are available from state regulatory bodies, runs were about 85.1% of rated calendar-day capacity.

ARKANSAS

(Refinery Runs in Barrels Daily)

Company and location—	September	August	September 1959
Amoco, El Dorado	31,292	29,301	*31
Lion, El Dorado	33,766	33,461	31,658
Macmillan, Norphlet	3,632	3,786	3,632
Other	5,478	5,917	6,050
Total Arkansas	74,168	72,465	41,371

*Refinery on strike.

LOUISIANA

(Refinery Runs in Barrels Daily)

Company and location—	September	August	September 1959
Cities Service, Lake Charles	165,052	166,737	175,089
Continental, Lake Charles	51,715	38,455	53,636
Humble, Baton Rouge	274,319	306,350	330,874
Ingram, Meraux	17,248	17,235	19,303
Shell, Norco	99,168	106,802	98,255
Tenn. Oil Ref., Chalmette	38,028	30,858	25,050
Other	7,833	7,835	7,852
Total Louisiana	653,363	674,272	710,059

MISSISSIPPI

(Refinery Runs in Barrels Daily)

Company and location—	September	August	September 1959
Paluxy, Yazoo City	1,682	1,412	1,177
Pontiac, Hattiesburg	15,703	17,394	19,670
Southland, Sandersville	3,777	6,355	5,104
Total Mississippi	21,162	25,161	25,951

OKLAHOMA

(Refinery Runs in Barrels Daily)

Company and location—	September	August	September 1959
Allied, Stroud	1,333	2,420	2,661
Anderson-Prich., Cyril	9,948	10,166	9,795
Bell, Grandfield	6,390	6,545	6,108
Ben Franklin, Ardmore	9,399	11,037	10,513
Champlin, Enid	26,499	27,429	27,513
Cities Service, Ponca City	31,576	31,600	35,206
Continental, Ponca City	67,013	67,372	77,379
DX Sunray:			
Duncan	40,198	41,695	41,655
Tulsa	70,312	61,418	68,648
Kerr-McGee:			
Cushing	19,001	19,063	23,061
Wynnewood	17,074	17,060	18,030
Midland Co-op., Cushing	13,038	13,019	13,453
Phillips, Okmulgee	14,043	15,600	17,008
Texaco, West Tulsa	37,708	41,667	42,164
Total Oklahoma	363,532	366,091	393,194

TEXAS

(Refinery Runs in Barrels Daily)

Company and location—	September	August	September 1959
Amoco, Texas City	127,034	144,116	96,608
Am. Petrofina:			
Mount Pleasant	15,506	15,385	18,321
Wichita Falls	6,799	5,756	4,893
Atlantic, Port Arthur	30,804	65,199	66,642
Col-Tex., Colorado City	7,621	9,219	12,979
Continental, Wichita Falls	12,825	12,149	9,300
Cosden, Big Spring	29,977	30,713	30,392
Crown Cent., Houston	34,459	35,117	33,897
Delhi-Taylor, Corpus Christi	34,199	33,962	31,523
Delhi & Mayfair, Port Isabel	1,139	5,753	7,534
Eddy, Houston	2,003	2,046	2,071
El Paso, Odessa	14,169	13,679	12,679
Gulf, Port Arthur	266,484	266,171	239,396
Humble, Baytown	286,614	270,885	259,998
La Gloria, Tyler	16,336	15,599	15,469
Mobil, Beaumont	196,106	204,975	174,536
Phillips:			
Phillips	54,032	62,290	63,050
Sweeny	58,332	58,166	73,826
Pontiac, Corpus Christi	48,133	44,556	44,922
Premier:			
Baird	3,031	2,453	2,176
Fort Worth	7,558	7,387	7,651
Longview	4,295	3,331	2,674
Pure, Nederland	75,118	83,494	64,548
Republic, Texas City	22,856	23,700	30,162
Shamrock, Sunray	24,240	24,713	18,258
Shell, Houston	108,144	108,670	105,620
Signal, Houston	48,357	52,044	47,573
Sinclair:			
Corpus Christi	27,362	27,994	27,074
Houston	125,031	129,954	129,012
Skelly, Longview	3,061	1,563	3,296
Southwestern, Corpus Christi	33,161	35,453	16,497
Stand. Tex., El Paso	41,092	51,452	37,665
Suntide, Corpus Christi	39,547	39,920	45,410
Texaco:			
Amarillo	16,347	17,677	11,356
El Paso	14,545	13,542	8,999
Port Arthur	238,266	288,239	243,346
Port Neches	40,723	39,771	40,235
Texas City, Texas City	27,129	32,404	28,844
Other	20,316	19,246	17,884
Total Texas	2,162,751	2,302,093	2,089,315

Argentina Opens Reserved Oil Areas

• A desire for quick expansion of oil production is behind the decision to seek bids from private companies. The move is a blow to nationalists and the state-owned YPF, which is also losing $80 million in federal funds.

ARGENTINA'S President Auturo Frondizi last week prescribed another dose of strong medicine to speed the cure of his country's oil ills with a decree opening exclusive YPF preserves to private development.

The controversial move, which had been fought by the state oil agency and nationalistic faction in government and the armed forces, will open the southern flank of the Comodoro Rivadavia producing area to private firms, both local and foreign. The 3,000-sq.-mile area is the chief area of YPF operations, and the source of some of the country's most prolific production.

Carlos A. Juni, Secretary of Industry, said that President Frondizi has ordered a quick invitation for bids from oil companies.

The action followed on the heels of another bold move by the government, in which YPF was told it would not get an $80-million federal grant for its expansion program next year.

The latest decree paves the way for deals between Argentina and Esso and Shell that will greatly expand the operations of both companies in the country. The companies have been quietly negotiating with the government for months.

Alvaro C. Alsogaray, Minister of Economy, indicated that proceeds from the awards will permit YPF to pay some of its debts for its expansion program, including contract drilling and refinery construction.

Alsogaray said that the southern flank must be brought into production faster than the financial resources of the government or YPF will permit. For this reason, private investment is essential.

The southern flank has reserves estimated at from 200 to 500 million barrels. Its rapid development will make available natural gas needed for a proposed $300 million pipeline system from Comodoro Rivadavia to Buenos Aires.

YPF support cut . . . The latest moves by President Frondizi came a little more than 2 years after his government put its head on a political chopping block by opening the country to foreign oil money.

The same administration, still very much alive, now has not only opened reserved acreage to private development, it has announced plans to cut off financial support that is the life blood of the state oil agency.

This means that an $80 million budget allotment YPF counted on to carry out its expansion program next year will not be forthcoming.

President Frondizi explained that from now on, YPF will have to carry out its expansion from its own revenues. He said the government would open new oil-bearing areas to private companies despite opposition.

The president revealed his plans at a meeting of the YPF board of directors a few days after he rode out another of the crises that have arisen over his oil policies.

The latest crisis to a large extent was over dissatisfaction with oil policies of YPF on the part of a faction of the military. After the storm cleared, the executive secretary of YPF, Dr. Arturo Sabato, turned in his resignation, and Alsogaray started a drive against state-owned oil and steel enterprises, and a partially completed electric generating plant.

Alsogaray, who addressed the YPF board along with Dr. Frondizi, said that areas now operated by YPF must be opened to private companies if the country is to become self-sufficient for oil by the end of 1961. He added that this move was necessary not only to increase crude production, but to free government funds for other programs.

"There is private capital to develop oil, but not to pay teachers' salaries," the economics minister said.

Oil policy works . . . The bold action to put a lid on YPF expansion reflects a changed political atmosphere in Argentina, despite recurring crises, and the conviction by the government that private capital is in fact solving the country's oil problems.

The government waited with trepidation for public reaction to a television speech by President Frondizi in July 1958 announcing that hundred-million-dollar contracts with foreign firms were being made to develop Argentina's already semiproved reserves. This was political dynamite in ultranationalistic Argentina. Overtures to foreign companies had triggered the overthrow of Dictator Juan Peron.

The government, however, withstood the opposition. One reason was a growing knowledge that the depression-ridden country could not possibly develop its own oil resources fast enough to keep up with demand. In 1958 the foreign exchange bill cost about $350 million. Another reason was that the hated word "concession" was carefully avoided. YPF keeps technical title to the oil.

Private operators since then have rejuvenated the country's crude-producing industry. Present crude production of 168,000 bbl. daily is up 86% from the period when the president announced his program. A large part of this gain has been accounted for by Loeb Rhoades and Pan American programs, whose growing output enabled private production to more than double to 49,900 bbl. daily between January and July.

The oil program is already showing marked results in the country's economy. YPF was able to discontinue crude imports this year, and the foreign exchange saving last year amounted to $76 million (OGJ, Oct. 10, p. 120).

Soviet Oil Going to Ceylon

CEYLON will be the newest market for Russian oil under a contract signed with a local firm for the sale of 130,000 tons per year, or about 2,600 bbl. daily, of products.

A newly organized firm, Ceylon Petroleum Co., said that laid down cost of Russian products at Colombo will be 25% less than the delivered price of private companies. Shipments will begin as soon as Ceylon Petroleum completes arrangements for bunkering vessels making deliveries.

The company has leased tankage from the government at Trincomalee.

Cut-Rate Soviet Prices Met in India

• Three private companies fight the Russians in the market place. But the firm's growth plans are stymied by the Indian Government. Even though the market is booming, the government won't permit refinery expansion.

INDIA is shaping up as the battleground for the first real scrap between the free international oil industry and cheap Soviet oil.

For three privately owned oil companies, already being pretty well smothered by a socialist-minded Indian Government, it is a fight for life. Soviet oil triggered the fight.

The three companies, Burmah-Shell, Standard - Vacuum, and Caltex, are faced with the two-pronged threat of enforced stagnation in a rapidly expanding market and competition from cheap Russian oil. Last week they began fighting back in the market place and the Indian Government was caught squarely in the middle.

The newly formed Indian Oil Co. was learning that its initial weapon of about 80,000 bbl. of Russian diesel oil may prove to be a dull sword.

In their battle for survival the three international oil companies are meeting the competitive threat head on. There is little they can do about the government's refusal to allow them to expand with the market. But they are fighting back on a price basis.

It all started months ago when the Russians offered to supply India with crude and the Indians grabbed eagerly at the offer. The government then tried to induce the three international companies to process the Russian oil in their refineries in India. The companies refused.

This prompted a switch in the Indian-Soviet trade deal. The 1.5 million tons of crude over a 4-year period was switched to products instead.

Then in a grandstand play, the Russians shipped the first 11,000 tons of diesel oil to India in mid-August. They were aiming at the Indian Independence Day celebration and a propaganda coup.

The only problem was that the new government - owned Indian Oil Co. wasn't ready. It had few personnel, no storage, no distribution system or equipment—and most important of all—no customers.

The 11,000 tons of diesel was hastily dumped into an old tank at Bombay which once belonged to the Indian Army. This lone tank is designed for offloading into rail tank cars and the new company's distribution system, when and if it is organized, will have to use tank trucks for distribution.

Last week the diesel was still unsold. In spite of this the Indian Government was saying publicly that the Russians were offering to expand their part of the trade deal to ship more oil to India and the Indians are considering the offer.

Bulk users of diesel were the first targets for the new government marketing company, but so far they aren't interested.

Bombay Electric Supply & Transport, a state-owned company which operates a fleet of double - decker buses in Bombay, told the new government oil company that its price for the diesel wasn't as good as that quoted by the usual source of supply—one of the private oil companies. Besides, the bus company told IOC it is not willing to take on a new supplier until it can be assured of future deliveries.

Another prospective customer, the transport company operated by the State of Maharashtra, told IOC that Standard - Vacuum was offering it diesel from the Stanvac Bombay refinery at cheaper prices than those wanted for the Russian diesel.

Burmah-Shell at just about the same time cut its diesel prices in northern India and made sales to the States of Uttar Pradesh and Punjab.

Caltex spokesmen in India said the third private company was prepared to do the same if a competitive situation makes it necessary.

Market expansion . . . Even with its traditionally slow - moving economy, India is suffering severely from growing pains. Its oil consumption in 1960 is expected to reach 8 million tons (an average of about 160,000 bbl. daily), a whopping increase of 20% over 1959.

This consumption compares with refining capacity of the three private companies of just about 100,000 bbl. daily, leaving a 60,000-bbl.-daily product deficit that must be imported.

Private company projections of Indian oil demand by mid-1966, the end of the company's third 5-year plan, place future consumption at 14 million tons or about 280,000 bbl. daily.

Indian Government estimates of demand in 6 years are slightly lower than this figure, but because of the growth in consumption the government is already making plans for expansion of its two planned refineries—and neither is yet well under way.

The combined throughput of the two refineries, one at Nunmati in Assam and the other at Barauni in Bihar, should be 55,000 bbl. daily by the time both are completed in 1962. They will operate on northern Assam crude from the privately developed Nahorkatiya region.

Last week the government said in view of new consumption estimates it planned to expand the capacity of these two plants to a total of 80,000 bbl. daily by 1966.

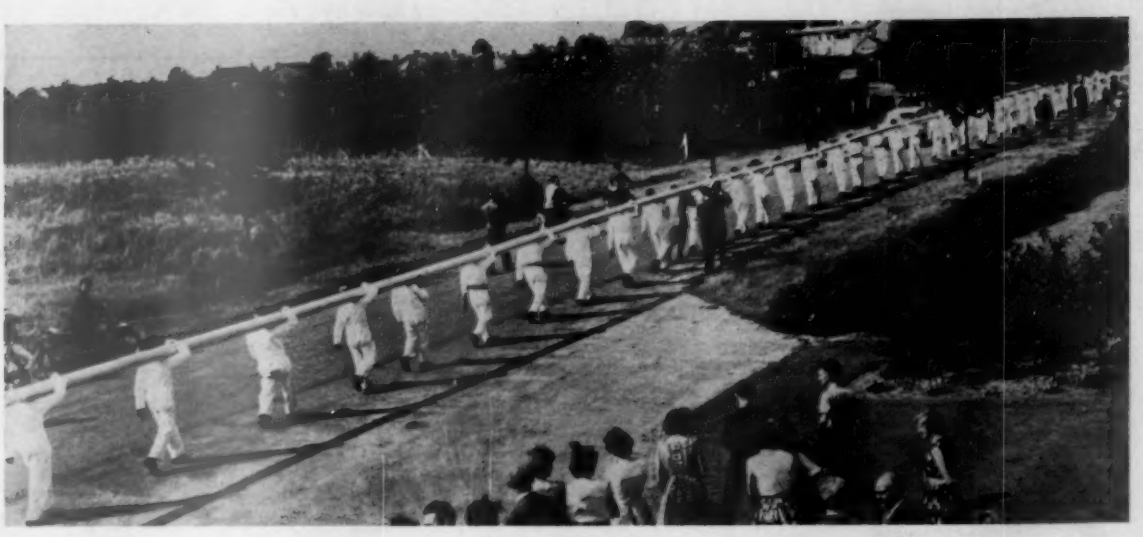
Refinery growth banned . . . It is now obvious that the government does not intend to allow any expansion at all in any of the existing and privately owned refineries. Even considering the planned small refinery in the Cambay area and any expansion in the old and privately owned Digboi refinery, there will be a gap of at least 50,000 to 60,000 bbl. daily between refining capacity and consumption by 1966.

Presumably the Indian Government expects to carry out the expansion of the two northern refineries, now being built with the help of the Russians, with additional funds from the Soviet Union.

All this means that even in 1966, India will still be faced with the prospect of importing petroleum products to satisfy its expanding local demand. If these imports are to be supplied by the Russians, they will certainly have to be marketed through the newly formed Indian Oil Co., which at present is little more than a paper company.

The private companies operating in India have tossed this new government enterprise the gauntlet. They are apparently ready to fight the fire of cheap Russian oil in Indian markets on a price basis.

Now the fledgling Indian marketing company will have to try and meet the competition of seasoned oil marketers. The fight might very well be a rough one, since the foreign companies will be fighting for their very existence.



Long Joint of Plastic Pipe Has To Be Moved by Manpower

OLD FASHIONED manpower turned out to be the answer to the problem of moving a 350-ft. length of P.V.C. plastic pipe from a Shell petrochemical plant in the Netherlands to a nearby railroad yard.

The 7-in. diameter pipe, carried on the shoulders of 55 men, was en route to an oil field near Rotterdam where it will drain off salt water produced with crude. It was made in one section to prevent leakage, which might harm surrounding farm land. During its manufacture, a hole was knocked in a factory wall to let out the lengthening pipe, which continued across a chicken yard and into a barley field. Nine open flat cars especially equipped with wooden blocks carried the pipe on a 150-mile trip to Rotterdam.

Roads were cordoned off while the men carried the pipe to the freight yard, and passers-by found the unusual parade highly amusing.

This is not the first time the oil industry has used unusual methods in the Netherlands. During construction of the new Rotterdam-Ruhr crude pipeline, the line was carried over the top of major dikes instead of being tunneled through. This was because the government would not permit the country's main lines of defense against the sea to be breached for any reason.

Expropriation Fears Soothed by Indonesia

INDONESIA is combining an iron hand and a velvet glove in its relations with private companies that run the free world's eighth ranking crude-producing industry.

President Sukarno has signed a bill that could pave the way for nationalization of the industry. The Indonesian Parliament has yet to approve the measure.

The government, however, has also issued a statement explaining the bill, which assures the companies that the socialist country does not plan expropriation. Instead, the government intends to let existing operators, Caltex, Stanvac, and Shell, continue to run the industry on a contractual basis.

Observers in Jakarta believe the immediate aim of the government is to use the law in order to secure better terms from Shell and Stanvac in coming tax and foreign exchange negotiations. Agreements that cover the government's oil revenues from the two companies expire December 31. Any new advantages gained by the government in coming talks probably would also be sought from Caltex, whose agreements end in 2 years (OGJ, Oct. 31, p. 73).

The government said the new law will make it impossible for foreign companies to get any new concessions in the future. But this comes as no surprise. Stanvac for years has sought in vain to secure new acreage, where it could try to develop fresh crude supplies to offset rapidly declining reserves.

State contracts . . . The government added that "because oil exploitation requires capital and experts," foreign firms will be given the opportunity to work as contractors for state companies. Exploration, refining, transportation and marketing will be carried on only by government companies.

If a state company is unable to do a job, the Minister for Basic Industries will be able to appoint a private firm as contractor to the state concern. The state company, in turn, must make contracts in line with the advice and directives of the minister.

The government brushed off existing concession agreements with the explanation that these were based on Netherlands East Indies mining laws, and these are no longer in conformity with Indonesian thinking. Indonesia became independent from the Netherlands 11 years ago.

Mining rights held by foreign companies will be valid for the time being, but they should stay valid for the shortest possible time, the government said.

Companies now holding mining rights will get priority when contractors are appointed for existing oil areas. Specific regulations covering the changeover will be spelled out later.

Shell said the new law will permit some sort of basis of cooperation between oil companies and the Indonesian Government.

Where Rigs Are Running Abroad

	Oct. 1960	June 1960	Aug. 1959
Latin America			
Argentina	109	106	88
Bolivia	15	15	11
Brazil	50	48	24
Br. Honduras			1
Colombia	18	22	26
Chile	4	4	5
Costa Rica	1	1	1
Cuba	1	1	1
Dom. Rep.	1	1	1
Ecuador	3	3	6
Guatemala		1	3
Mexico	153	140	120
Peru	11	11	4
Puerto Rico	1	1	1
Trinidad	25	25	31
Venezuela	43	42	61
TOTAL	435	418	384
Middle East			
Bahrain	1		
Iran	14	16	10
Iraq	11	11	8
Israel	4	6	4
Jordan			1
Kuwait	2	2	3
Neutral Zone	6	6	4
Qatar	2	2	1
Saudi Arabia	3	3	6
South Arabia	2	2	3
Syria	2	2	2
Turkey	11	11	11
TOTAL	58	61	53
Western Europe			
Austria	9	9	9
France	30	50	57
W. Germany	100	100	127
Italy	36	36	36
Netherlands	4	4	3
Spain	6	8	8
Switzerland	1	1	
U. K.	4	7	5
TOTAL	190	215	245
Africa			
Algeria	38	53	40
Angola	3	3	2
Egypt	11	11	11
Fr. Eq. Africa	6	6	11
Fr. W. Africa	1	3	2
Gambia	1	1	
Libya	35	32	15
Madgascar	1	2	3
Morocco		1	5
Nigeria	5	5	8
Span. Sahara	1		
Somalia	2	2	2
Tanganyika			1
Tunisia			3
TOTAL	104	119	103
Asia-Pacific			
Australia	4	4	4
Brit. Borneo	2	2	2
Burma	3	3	4
Formosa	1	1	1
India	8	8	5
Indonesia	15	15	15
New Guinea (inc. Papua)	1	1	1
New Zealand	2	2	1
Pakistan	5	5	6
Philippines	3	3	1
Timor	1	1	1
TOTAL	45	45	41
GRAND TOTAL	832	858	814

NOTE: Estimates made where complete up-to-date reports are lacking.

Foreign Rotary Drilling Is Down Slightly

● But the slack-off from midyear level of operations outside the U. S. and Canada is spotty. Activity has stepped up in some areas, notably Libya.

THE JOURNAL'S tally shows that rotary drilling outside the U. S. and Canada has slumped from the mid-year level. But despite a world-wide surplus of crude oil, activity is high.

October surveys listed 832 active rigs, 26 fewer than in June. This total includes rigs working on new hole, but does not cover equipment on service wells or workovers.

In the U. S., the number of active rotaries increased between mid-June and mid-October to 1,789—a gain of 29. Drilling in Canada, where the winter freeze has not yet set in, is down to 159 active rigs or 6 fewer than in June.

Thus the grand total of active rigs is 2,780 throughout the Free World.

The tempo of drilling outside the U. S. and Canada naturally reflects an intense pressure for high drilling budgets in some areas, although oil supplies are ample on an over-all basis.

North Africa busy . . . Activity in Libya has been stepped up more than ever.

Part of this bustle stems from the need of some companies to decide which areas they want to hand back to the government under the original concession pacts. Deadline for the first round of relinquishments is this month, and by May almost half of the existing concessions will be trimmed by 25%.

Busiest operator is Oasis Oil. Twelve of its 35 outfits are making hole, with the largest concentration of the company's equipment in the Dahra field area of Block 32.

Companies with four rigs active include Esso Libya and Esso Sirte, both Jersey Standard affiliates. Mobil, British Petroleum, and Shell each have three. CPTL, a French company, and Deutsche Erdol, a German firm, each have one.

Fourteen rigs are running in Iran, the most active drilling area in the Middle East at present. Besides six wells being drilled in the consortium area, IPAC (Indiana Standard) and SIRIP (ENI) each have two outfits on their own concessions. The government company, NIOC, has four wells drilling.

In France and in the French Sahara, drilling has fallen off since June. Of 38 rigs working in the Sahara, eight are in Hassi Messaoud oil field—four on the SN Repal side of the field and four on the CFP side. Two wildcats are also being drilled by CFP. Phillips Petroleum, Sinclair Oil and Cities Service each have a single rig drilling.

FOR RELIABLE, UNFAILING ELECTRIC OPERATION... It's the HYDRAMOTOR® valve, designed by General Controls for lines up to 12″ diameter and offering the advantages of single-unit, sealed-in-oil hydraulic ram power that's controlled by simple 2-wire circuitry.

Electro-hydraulic power operation eliminates complicated linkages and gearing, as well as need for outside air or gas supply—and it's fail-safe because the valve returns to safe position by spring force if power is interrupted. Ideal for use in cold weather, the Hydramotor is available in a low temperature unit designed for ambient conditions to –40°F.

BE QUALITY SURE...ALWAYS SPECIFY GENERAL CONTROLS

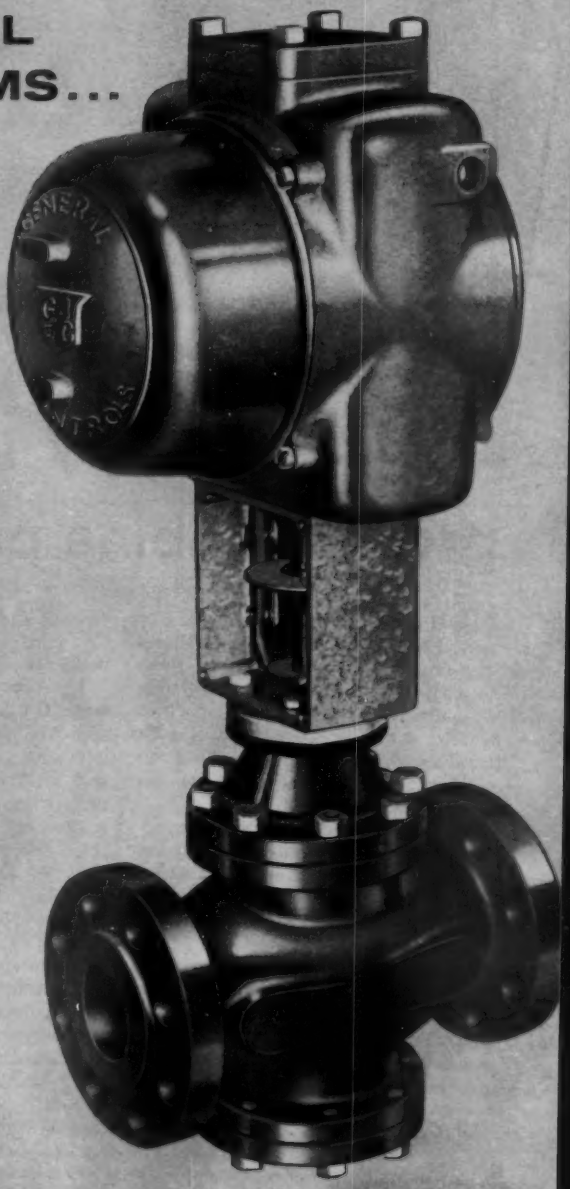
GENERAL CONTROLS

Automatic Controls for Product or Process

Glendale, Calif. • Skokie, Ill. • Guelph, Ontario, Canada

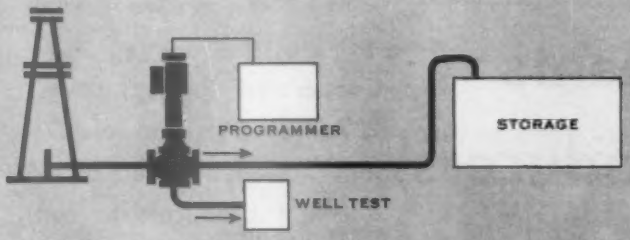
Nine Plants—44 Factory Branch Offices Serving
The United States, Canada and Western Europe

HERE'S THE VALVE THAT SOLVES YOUR OIL FIELD CONTROL PROBLEMS...

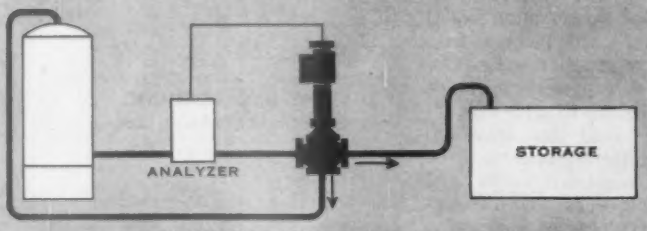


THREE BASIC TYPES of hermetically sealed Hydramotors are available in dust proof, drip proof, explosion proof and weather proof models: **Standard Hydramotors** provide open, closed, or in-between positioning. **Three-way 2-position units** provide for diverting flow from a common source to either of two outlets. **Three-way 3-position Hydramotors** carry flow from well to production, to test sampling or secondary tank, or to shut off. Hydramotor valve actuators are manufactured in a range of 180 to 6000 pounds of stem thrust and in a stroke range of ⅝″ to 4½″. Valve bodies of cast iron, cast bronze, cast carbon steel, stainless steel and other alloys are available in 150, 300, 600, 1500, 3000 and 6000 lb. ASA ratings.

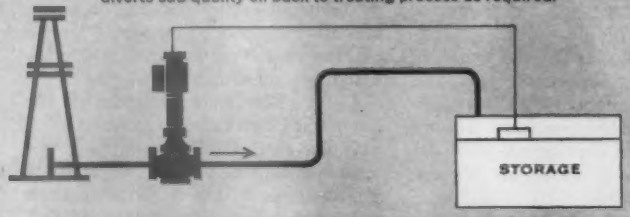
Write today for complete information. Ask for Bulletin 608.338.



WELL TESTING, 3-way 2-position Hydramotor valve samples rate and quality of flow on command or through programming equipment. The 3-way 3-position Hydramotor not only diverts flow but also provides full shut off for well shut in.



AUTOMATIC CUSTODY TRANSFER, 3-way 2-position Hydramotor diverts sub-quality oil back to treating process as required.



TANK SWITCHING, a standard Hydramotor controls level in storage tanks.

CENTRAL FRACTIONATION PLANT at Buck Creek receives feed stocks from eight satellite extraction units in Pembina field. It has capacity of 5,600 bbl. daily.

Liquid-recovery plants profit Pembina producers

Cooperative project covers 207,000 acres, connects 279 tank batteries owned by 76 different producers to central fractionation facilities, and has design capacity of 90,750 M.c.f.d.

BY H. C. BOZEMAN
Gulf Coast Refining Editor

EIGHT SATELLITE field-recovery units are the key to successful flare-gas conservation at Pembina field. Costing over $20,000,000, the system annually saves about 26 billion cubic feet of natural gas for marketing or reinjection, and produces about 60 million gallons of marketable gas liquids.

Pembina field lies in the vast remote Canadian foothills belt 80 miles southwest of Edmonton, Alta., where temperatures commonly drop to –40° F. during the severe winters with chill factors from –60° to –70° F. The vast scope of this project, covering an area of more than 300 sq. miles, and its unique organization and financing are unequaled in the oil and gas industry as a flare-gas conservation project.

Background

Early in 1957, Pembina producers began planning a system to conserve 95% or more of the casing-head gas then currently flared at Pembina. Goliad, Ltd., and Goliad Oil & Gas Co. were selected to own and install these facilities.

In August of that year, the Alberta Oil & Gas Conservation Board approved plans to divide Pembina field into nine gas-conservation areas. Goliad facilities were to serve eight of the areas and Texaco to serve one.

Dividing this field into areas enabled the gas-gathering systems to be built of smaller-diameter pipe and with no river crossings. The divisions were based on ownership; geography, because of the two major rivers running through the field; and producing characteristics of the wells.

Goliad Oil & Gas Co., on behalf of the producers, supervised the construction. In October 1957, contracts were let. Construction was finished and all facilities were in operation before November 1, 1958, the deadline set by the board.

Financing of the entire project, over $20,000,000, was arranged by Goliad Oil & Gas Co., and Goliad, Ltd. Unless he elected to, no producer was required to invest his own capital. Producers in the eight areas served by Goliad facilities backed the financial arrangements by contracts known as "the master agreement," and individual purchase contracts.

H. W. Bass is the founder of the companies, including Goliad Oil & Gas Co. and Goliad, Ltd., and the ideas employed. Dr. C. T. Wells is president, and Dan T. McDonald is executive vice president of the Goliad companies in Canada.

The eight conservation areas cover

an area of about 207,000 acres, each area having its own complete casing-head-gas recovery unit. The wet gas to these satellite units is collected at low pressure from the tank batteries. Currently, 279 tank batteries owned by 76 different producers are connected to the system which has a design capacity of 90,750 M.c.f.d.

The satellite units compress and dehydrate the gas, extract the liquids, and deliver the residue gas to the utility pipeline. The recovered gas liquids are piped from the eight satellites through a pipeline system to the central fractionation plant. The fractionated products of propane, normal butane, isobutane, and natural gasoline are sold at the plant or piped to the Breton rail-truck terminal, 18 miles to the east.

Organization

The gas-conservation system is a unique organization, being divided into two operations, with each operation handled by a separate corporation. One operation is the "field" which handles the field facilities in all eight areas. The other operation is the "plant" which covers the gas-liquids gathering line, fractionation plant, and marketing facilities.

Each of the eight field facilities is owned by a separate corporation that is a subsidiary of Goliad, Ltd. The eight field corporations make up Pembalta Gas System and are numbered 1 through 8. These separate corporations are deemed necessary because the producers in each area function as an independent group, with regard to gas conservation, and have varying ownerships. The Pembalta corporations lease the gas facilities they own in each area to the producers in that area.

The producers contract Goliad, Ltd., to operate the field facilities. Goliad, Ltd., is directed in the operation of these facilities by an area advisory committee in each area. A composite committee, the joint area advisory committee, coordinates the eight area committees' operating programs and acts as a committee of the whole.

The plant facilities are operated by Goliad Oil & Gas Co. independently of the field operations. The gas liquids from each area are bought by Goliad Oil & Gas through individual liquid component purchase contracts with each individual producer. Settlement is made on a net resale basis.

Pembalta Installations

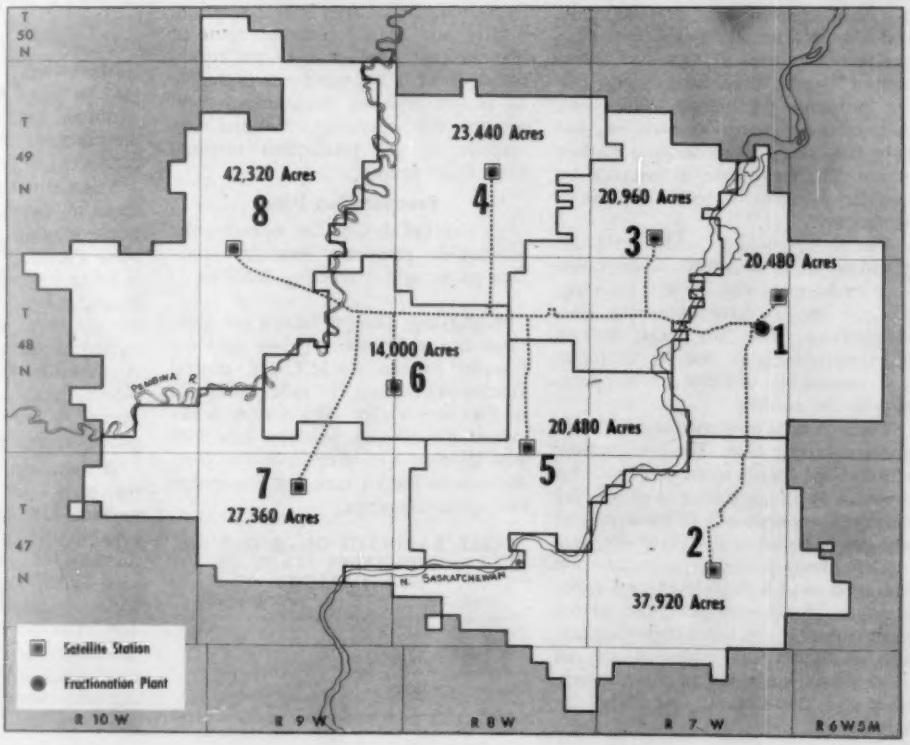
The eight satellite stations are alike in plan and operation, but differ in size. The satellites are designed for semiattended operation. Each station has a house for the operator who is on duty 8 hours daily. The remainder of the time the station is unattended.

Operation. The wet gas is metered at each battery as it enters the system and the total gas to each station is measured as it enters that station. The pipeline gathering system is designed for an inlet pressure of 30 psig. at the tank batteries and 20 psig. at the stations. Table 1 shows the number of batteries served, the length, and the pipe-size range for each area.

After entering the station, the gas is compressed in two stages to 470 psig. The second-stage gas is then dehydrated and refrigerated. A combination ethylene glycol injection and contract system is used for dehydration. A conventional propane refrigeration system provides cooling to –10° F. for gas-liquids recovery. The process is designed to recover 50% of the propane content in the inlet gas. The gas liquids are warmed to about 40° F. for flash stabilization before pumping to the Buck Creek central fractionation plant.

Dry residue gas from the low-temperature separator is further compressed to about 900 psig. for reinjection in the field for pressure maintenance, or sold to a utility for delivery to Edmonton. The residue gas meets pipeline specifications of less than 4 lb. of water per M.M.c.f., and a hydrocarbon dew point of less than –15° F. Producers retain title to residue gas and sell directly to Northwestern Utilities, Ltd.

Construction features. The gathering system is built of light-wall pipe,



EIGHT satellite stations, each owned by a different company, funnel gas to the fractionation plant. Gathering system contains 292 miles of 3-12-in. pipe.

TABLE 1—GOLIAD LTD., GAS GATHERING AND PROCESSING FACILITIES

Gas System No.	Acreage Served	Batteries Served	Pipe Size Range (in.)	Gathering-System Length, Miles	No. of 660-hp. Compressors	Wet-Gas (Compressor Capacity) M.c.f.d
1	20,480	23	3- 8	22.9	3	8,250
2	37,920	58	3-12	57.4	6	16,500
3	20,960	38	3- 8	31.3	4	11,000
4	23,440	33	3-10	32.1	4	11,000
5	20,480	33	3- 8	31.1	3	8,250
6	14,000	10	3- 8	14.0	3	8,250
7	27,360	29	3-10	37.4	4	11,000
8	42,320	55	3-10	65.5	6	16,500
Total	206,960	279		291.7	33	90,750

0.134-in. wall thickness for 3 and 4-in.-diameter pipe, and 0.141-in. wall thickness for the 6 through 10-in.-diameter pipe.

Except for the air-cooled heat exchangers, all equipment is housed in the compressor, process, and glycol regenerator buildings.

A total of 21,780 hp. is installed to handle the gas compression and refrigeration loads. The gas-engine compressors are 660 hp. each. Table 1 shows the number of compressors installed at each station and the wet-gas capacity.

Individual locations presently have three, four, or six-engine-compressor units. The process units at each satellite station are sized for either four-engine units or six-engine units; thus, if additional gas becomes available at a three-engine station, a fourth unit can be added without having to enlarge the processing equipment. Limiting process design to the two sizes saved engineering and drafting time, and also lowered purchasing costs.

Each compressor has five compressor stages, three for gas and two for propane refrigerant. The compressors are semiskid-mounted, but have common gas header and coolant piping. The gas header is installed inside the compressor room for winter protection.

The jacket water, a 50% ethylene glycol solution, is cooled in air-cooled heat exchangers outside the building. The air coolers have automatic two-speed fans, with automatic louvers for recirculation of hot air to maintain reasonably uniform air temperature to the coolers.

Each plant is instrumented for fully automatic operation. The compressors are equipped with standard shutdown controls. If all engines shut down, the station is automatically blocked in, and wet gas is flared at the plant site.

The plant process vessels are equipped with high-level and high-pressure shutdowns, and the glycol regenerator system has a high-temperature shutdown. Operation of any of these shutdowns stops all compressors, blocks in the station, and flares incoming wet gas.

A central maintenance group handles all maintenance and is based at Drayton Valley, headquarters for Goliad, Ltd. Almost 100 miles must be driven to visit all eight satellite stations in sequence. Communications are by two-way radio system which is uniquely adapted to signal the central fractionation plant, where 24-hour attendance is maintained, in the event any compressor goes off the line or the satellite shuts down while the operator is off duty.

The affected satellite transmits a selective tone signal to the central plant where, after decoding, it turns on an identifying light on the control panel. The central plant operator then can contact the operating foreman so that, if necessary, personnel can be dispatched to restart the equipment.

Simultaneous with the radio tone signal, another circuit rings a buzzer in the attendant operator's house. If he is at home, he goes into the station, notifies the central plant operator of his presence, and restarts the equipment. If he is not home, or is unable to restart without maintenance personnel, the operating foreman can arrange to get production restored with little delay.

Fractionation Plant

Goliad Oil & Gas Co. operates the gas-liquids gathering line, fractionation plant, and marketing facilities.

Gathering. The gas liquids are gathered into a 55-mile pipeline grid for transfer to the Buck Creek central fractionation plant, 10 miles southeast of Drayton Valley. The system is designed for 50-psig. pressure loss with pipe diameters ranging from 3 to 6 in. In route to Buck Creek, the line makes two river crossings.

TABLE 2—GOLIAD OIL & GAS CO. FRACTIONATION PLANT DESIGN CAPACITY

Product	bbl./day
Propane	2,750
Isobutane	350
n-butane	1,370
Natural gasoline	1,150
Total	5,620

Fractionation. The Buck Creek plant is a standard fractionation unit of 5,600-bbl. daily capacity. It uses hot oil for heating, and propane refrigeration and air-cooled heat exchangers for cooling. Four fractionation towers separate the incoming raw product into propane, normal butane, isobutane, and natural gasoline. Table 2 shows the design capacities. The isobutane has a purity of 95%. Propane from the plant has a 95% purity and the natural gasoline has an R.v.p. ranging from 12 to 16 lb. depending on marketing requirements.

The four fractionation towers are set outside the corners of a 40 by 40-ft. process pump and control building. Accumulator vessels are mounted on the roof. Air-cooled heat exchangers are used for all final cooling. They have manual two-speed fans, with open-air intakes and manual louvers for air-temperature control.

The propane refrigeration cycle condenses deethanizer overhead at 10° F. and 450 psig. Refrigerant compressors and headers are housed in another building separate from the process area, as in the case of the Pembaltas.

A circulating hot-oil system supplies plant heat and no steam is generated at the plant site. All fans and pumps are electric drive with power being purchased from Calgary Power, Ltd., which also serves the field.

Five residences are located at Buck Creek, four are occupied by plant operators, and one by the superintendent.

Marketing. The finished products may be piped to the Breton rail-truck terminal, loaded into tank trucks at the plant, or sold directly to pipelines connected to the plant.

The plant has storage capacity for about 5 days' production and tank-truck loading facilities for all products. Presently most of the gasoline is being sold at the plant to Pembina Pipeline, Ltd., crude-gathering system for delivery to Edmonton. Some is moved by transports to other markets. A miscible flood operated by the North Pembina unit buys all of the normal butane and part of the propane via pipeline from the plant.

A 6-in. product pipeline connects the plant and the Breton rail-truck terminal 18 miles to the east. It is capable of handling all the plant production by batch delivery; however, only isobutane and some of the propane are currently being handled this way. The Breton terminal has a 10-spot tank-car loading rack, a 2-spot tank truck loading rack, and storage capacity for 300,000 Imp. gal. of products.

How recoveries are increased in Lake St. John Unit

• Unitized operation plus dry-gas injection into a wet gas cap means more liquid recovery, and a reservoir full of dry gas to be produced when needed. Here is a case history of operations that are yielding 35% oil recovery, and 85% wet gas take.

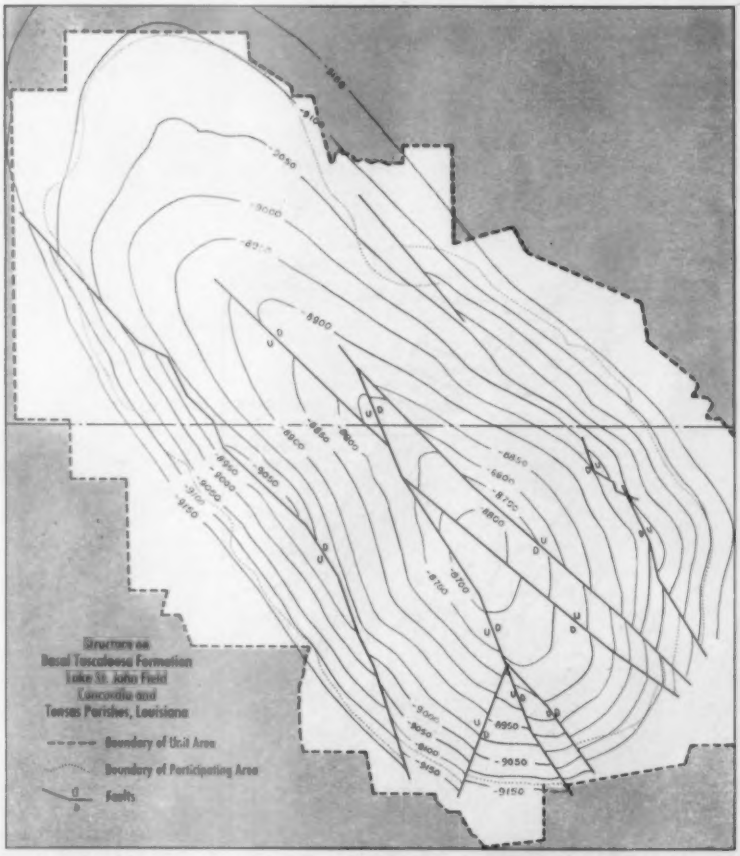
BY PAUL R. WADDLE

. . . petroleum engineer and partner in the oil and gas consulting firm of Brookings, Moffatt & Waddle, of Shreveport. Waddle worked for Carter Oil Co. from 1945 to 1958 in Kansas, Oklahoma, Arkansas, Louisiana, and Alabama, attaining the position of division reservoir engineer in the company's southern division at Shreveport. He received special reservoir training at Carter's research laboratory and assisted in teaching reservoir engineering in Carter's program. He is a 1943 graduate of Oklahoma University where he received his BS degree in petroleum engineering. He is a registered professional engineer in Louisiana and Texas.

GAS-CAP-DRIVE mechanism, and cycling of gas-cap gas are combined in one operation to improve the recoveries from the Lake St. John unit in Concordia and Tensas parishes, Louisiana. Discovered in 1942, the field has been operated as a unit since 1947.

Development and unitization. Production from the basal Tuscaloosa formation (Upper Cretaceous) of Lake St. John field was started in June 1942 with the completion of a well in the gas cap at the crest of the structure. Depth was 9,000 ft. Later drilling defined the structure as an elongated dome and uncovered the oil band around the flanks. The development pattern was varied to conform to the annular shape of the oil band, with wells located structurally low so as to allow the displacing gas-cap gas to sweep through a maximum of oil zone for the highest recovery efficiency.

The basal Tuscaloosa productive area, about 3 miles wide and 8 miles long, covers some 13,000 acres. The net effective pay ranges up to 83 ft. in thickness and productive closures in the gas cap and oil band amount to 200 ft. and 104 ft. respectively. The structure has a dip of 1° to the northwest and about 5° in the other directions. A structure map of the basal Tuscaloosa formation is shown in Fig. 1.



GAS ZONE in basal Tuscaloosa formation originally contained 261,000 acre-ft. of gas in place. Oil zone contained 233,000 acre-ft. with 160 million stock-tank barrels of oil. Fig. 1.

Originally, the gas zone contained 261,000 acre-ft. with 325 billion cubic feet of gas in place while the oil zone contained 233,000 acre-ft. with 160 million stock-tank barrels of oil in place. The gas cap at original pressure of 4,250 psig. contained over 70 bbl. of stock-tank condensate per M.M.c.f. of gas.

Salt dome. Structure of Lake St. John field results from a deep-seated salt plug and early in the life of the field the presence of complex faulting was evident. Pressure-production history and general reservoir performance in the Tuscaloosa shows that the faulting interferes with the continuity of the reservoir. This tends to cause various areas or fault blocks of the field to perform basically as separate and individual segments.

As development of the field proceeded it became evident that unitized

pressure-maintenance operation with return of produced gas to the reservoir would be advisable to get recovery efficiencies not otherwise possible. Unit operation would permit cycling of the gas cap to cut retrograde condensation losses, and exploitation of the oil band under a high-pressure gas-cap drive to get maximum recoveries.

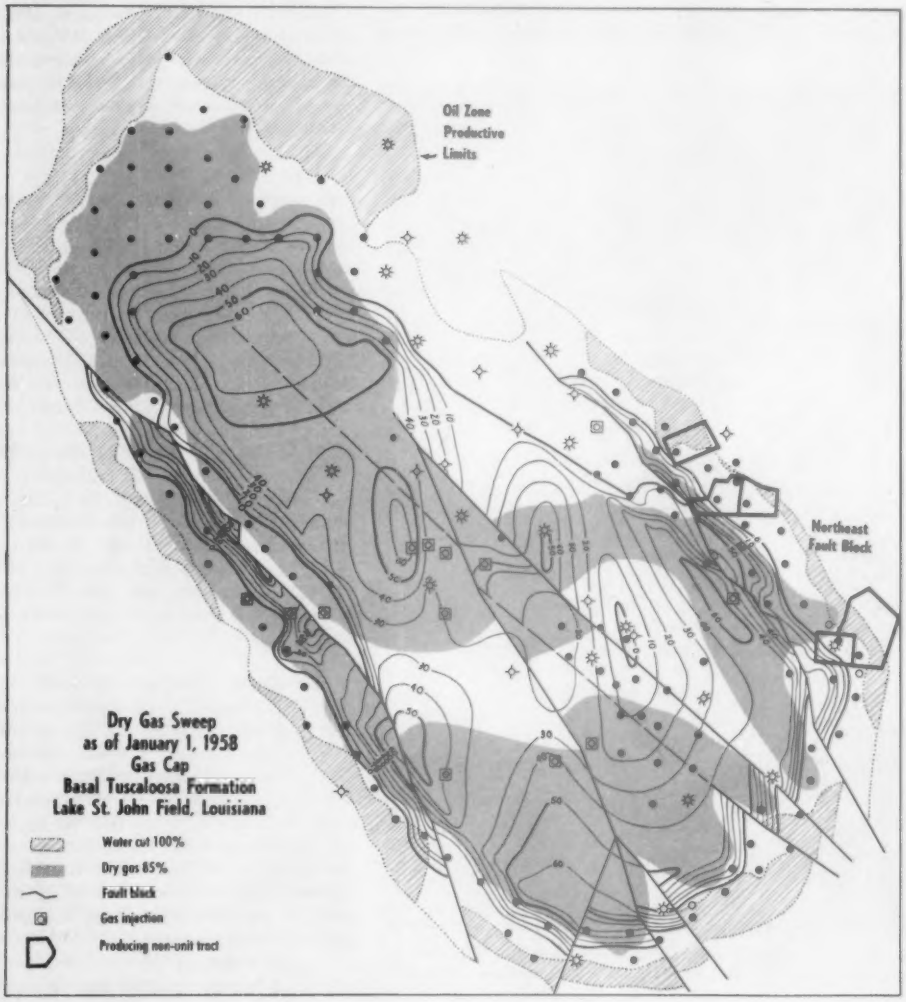
Most of the field operators at Lake St. John foresaw the benefits of a unitized operation. In June 1947 these operators, with the cooperation of their royalty owners, started pressure maintenance operation in the basal Tuscaloosa by returning produced gas to the reservoir through wells in the gas cap. With the exception of eight Tuscaloosa wells, all tracts and wells productive in the basal Tuscaloosa were unitized. Nonparticipating properties lie in a portion of the field called the northeast fault block. This block also contains tracts and wells that are participating in the unitized cycling project, and consequently operators of these tracts elected to reinject produced gas as a part of the over-all field cycling program. The nonunit tracts in the northeast fault block either sell or flare their produced gas from the basal Tuscaloosa.

Louisiana Department of Conservation order No. 135-A dated June 28, 1949, and No. 135-A-A dated March 8, 1951, approved the over-all operation. The orders regard the northeast fault block portion of the field as a separate reservoir and so set up the individual wells in this area on a competitive basis.

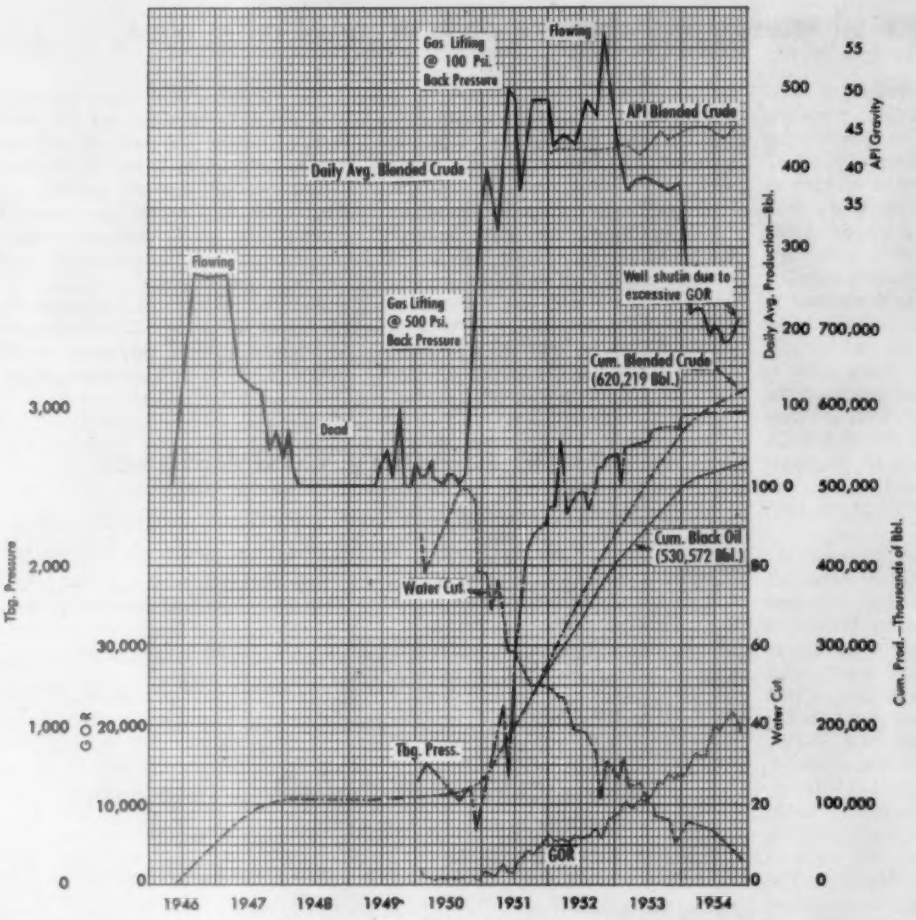
Pressure maintenance in the basal Tuscaloosa is accomplished by a cycle of operations: (1) withdrawals from the reservoir through selective oil wells, (2) removal of stock-tank oil, condensate, and other liquid hydrocarbons by processing through an extraction or gasoline plant, and (3) compression and return of the dry plant residue gas to the reservoir through injection wells which are located in the crest of the gas cap so as to cause the returned dry gas to cycle the gas cap and sweep the oil band.

Producing mechanism. Oil is produced from the basal Tuscaloosa reservoir by gas-cap drive. The gas cap is caused to expand downdip to displace wet gas-cap gas and black oil toward the structurally lower producing wells in the oil band. Producing energy of the gas is sustained by returning to the gas cap all residue formation gas plus necessary makeup gas from other unitized reservoirs. Makeup gas is supplied by a series of overlying wet-gas reservoirs called the Eutaw sands, and one deeper dry-gas reservoir, the Paluxy.

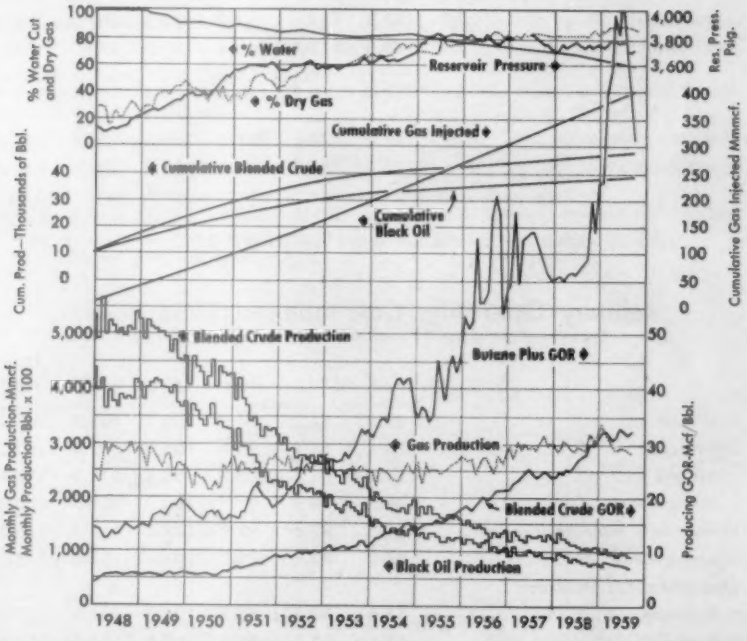
Gas injection, using essentially a radial drive pattern, is carried out on basis of the several fault blocks into which the reservoir tends to subdivide itself. From the input wells, Fig. 2, the dry-gas front has moved outward through the gas cap, then downdip through the underlying oil zone and finally into the producing oil wells.



DRY GAS FRONT has moved so that it has invaded the outside row of oil band wells. Fig. 2.



PRODUCTION HISTORY of 13 Marks well shows daily average crude production, cumulative oil production, and other information. Fig. 3.



PRODUCTION STATISTICS for the basal Tuscaloosa reservoir, Lake St. John unit. Fig. 4.

In the interest of achieving maximum use of the gas-cap drive, reservoir withdrawals are taken from the lowest gas-oil-ratio wells of the oil band. Oil-band performance has been characterized by oil production at solution gas-oil ratios, of the order of 1,100-1,500 cu. ft. per barrel, before the gas front reaches a well. As the dry-gas front nears and invades a well, the gas-oil ratio increases suddenly and thereafter continues to rise to an uneconomic range. Then the well is shut in. At present the dry-gas front has moved so that it has invaded the outside row of oil-band wells, Fig. 2. The updip movement of water is shown by the broken line, Fig. 2. This condition provides only a limited opportunity for gas-oil-ratio reduction by transfer of withdrawals to wells in the uninvaded portions of the oil band.

Individual well histories show that the gas-cap drive is effective. Consider Unit Well No. 33. It was recently drilled downstructure, offsetting wells which were almost at their economic limits because of high gas-oil

"Ultimate oil recovery will approach 35% of initial oil in place."

ratios. The well was completed making more than 99% water. After the well was produced on gas-lift for about 2 months, it began producing oil by natural flow. It tested as high as 940 bbl. per day of black oil with near-solution gas-oil ratio of 1,680 cu. ft. per barrel and 80% water cut.

In seeking an optimum producing rate, oil withdrawals were reduced to about 300 bbl. per day under a trend of decreasing water cuts and increasing GOR. The GOR behavior is thought to be a normal result of the producing mechanism which involves expansion of gas into the well from the gas cap. Unit No. 33 produced 232,000 bbl. of oil in a 3-year period, after which it was shut in due to high GOR.

Among other field examples of the effectiveness of the gas-cap drive are Unit No. 22, Marks No. 13, and Scott No. 7. The general history of these wells is that they flowed for an initial period of some 2 years under trends of increasing water cuts. Upon reaching high water cuts the wells became water logged and died, having produced some 100,000 bbl. black oil. Attempts to restore productivity by beam and hydraulic pumping failed because it was not physically possible to lift enough fluid from the wells to maintain economic production. The wells remained shut in for a number of years. At this point, the wells normally would have been candidates for abandonment. Gas-lift equipment was installed, and the wells were produced at rates in excess of 1,000 bbl. fluid per day. Oil production was reestablished at each of the wells and soon thereafter they began to flow at rates of 300-600 bbl. per day. This was sustained over periods of 2 to 3 years. Cumulative black-oil production during the revived periods have averaged 400,000-600,000 bbl. per well. Production history of Marks No. 13 is shown in Fig. 3.

Production history. As of October 1, 1959, a total of 120 oil zone wells and 12 gas-cap wells had been completed in the basal Tuscaloosa unit. Total production amounted to 38.5 million barrels of black oil and 9.5 million barrels of stock-tank condensate. Daily average production for September 1959 was 2,250 bbl. of black oil and 700 bbl. of stock-tank condensate with an over-all GOR of 32,200 cu. ft. per bbl. Total plant wet-gas intake averaged 120 million cubic feet per day, consisting of 95 million cubic feet of basal Tuscaloosa gas and 25 million cubic feet of make-up gas. Gas injection through 12 active wells averaged 105 million cubic feet per day and cumulative gas injected as of October 1, 1959, totaled 404 billion cubic feet. Unit production statistics are given in Fig. 4.

Gas-injection rates have approximated oil and gas withdrawals so that a high degree of pressure maintenance has been achieved. Pressure has dropped only 391 psi. from the level of 3,991 psia. at start of injection in 1947.

The pressure-maintenance operation is expected to continue for 5-7 more years. Ultimate oil recovery will approach 35% of the initial oil in place.

The over-all injected gas-displacement efficiency in the gas cap will exceed 55%, while ultimate wet-cap-gas recovery will amount to 85% of the initial gas in place.

The basal Tuscaloosa reservoir holds gas reserve of some 320 billion cubic feet which will be produced in the future on blowdown of the gas cap.

Nelson Refinery Cost Indexes

Published in the first issue each month in the Technology-Operation Section.

Compiled by W. L. Nelson, Techincal Editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issues of the month of January, April, July, and October.

Refinery Construction Cost Index (1946 Basis)

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1957	1958	1959	June 1960
Pumps, compressors, etc.	138.2	166.5	206.7	214.7	226.5	228.3
Electrical machinery	134.9	160.0	188.9	192.7	195.8	195.0
Internal-combustion engines	126.0	150.5	173.9	178.3	178.5	179.0
Instruments	127.8	154.6	187.4	194.9	201.0	204.3
Heat exchangers	140.0	171.7	203.6	181.2	178.9	195.7
Miscellaneous equipment average	*126.2	160.7	192.1	192.4	196.1	200.5
Materials component	149.5	174.6	201.9	204.2	207.8	207.7
Labor component	144.0	183.3	208.6	220.4	231.6	242.6
Nelson construction index	146.2	179.8	205.9	213.9	222.1	228.6

*Used in computing the Nelson Index until April 1952.

Refinery Operating Cost Indexes (1956 Basis)

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1958	1959	May 1960
Fuel cost	49.6	81.0	86.5	102.1	103.5	107.2
Labor cost	73.1	88.7	90.9	105.0	102.3	103.3
Wages	52.4	81.5	88.7	105.4	111.5	113.6
Productivity	68.3	90.2	97.1	100.3	109.0	110.0
Investment, maintenance, etc.	51.2	83.6	92.0	109.5	113.7	116.2
Chemicals cost	37.0	72.1	85.7	104.4	107.8	115.5
Operating cost indexes:						
Refinery	58.5	80.5	88.7	105.8	106.8	109.6
Process units†	62.9	82.2	88.4	105.8	106.0	107.9

†Add separate index for chemicals, if any are used.

New 8-in. air hammers cut drilling costs in big holes

BY J. E. ECKEL
Jersey Production Research, Tulsa
S. D. MURRAY
Jersey Production Research, Tulsa
B. M. VAN METER
Humble Oil & Refining Co.,
Carter Division, Tulsa
AND W. E. LILJESTRAND
Mission Manufacturing Co., Houston

FIELD TESTS of a new 8-in. hammer drill prove that it can extend percussive air and gas drilling to hole sizes as large as 13¾ in.

Previously, the 6-in. and smaller hammer drills which were available were suited for holes not larger than 9-in. diameter.

The 8-in. tool operated without mechanical trouble and made hole 1⅔ to 2⅓ times faster than conventional rotary air drilling. Moreover, bit life was 30 to 60% longer.

At first, there was trouble with breakage of the large bits and with water in the hole. The bit trouble was solved by the manufacturers and the wet-hole problem was overcome by using a new rubber-diaphragm float valve just above the bit.

The 8-in. hammer drill is now available commercially in the Mid-Continent, Appalachian area, and in western Canada. Field tests described here were in the McAlester basin; these tests led to the following conclusions:

1. Because of the savings, the 8-in. hammer tool should be used to drill any hard-rock lithology where hole diameters are large.

2. To offset the hammer drill's rental cost, it is important to carefully study the lithology and rock drillability of the area to insure that the tool is run where it can save.

3. Only the 8-in. hammer tool should be used in drilling holes larger than 9⅞-in. Its energy output is so much greater than the 6¾-in. tool that the smaller one cannot perform nearly so cheaply.

4. The 8-in. hammer tool is essentially trouble-free. A minimum of supervision, repairs, and maintenance is required for its operation.

5. The large hammer drill, when used with 8-in. drill collars, will maintain straight hole in "crooked-hole" areas and will help straighten hole when other practices have caused excessive deviation.

6. To solve the problem of hammer drills plugging in wet hole always use the new-type bit float valve.

Moreover, in many areas, extremely hard rock drilling begins at the surface conventional rotary methods cannot provide enough weight for effective drilling. This problem does not affect percussion drilling, which provides a means for rapid surface drilling at whatever weights are available.

Presented at 1960 annual meeting of American Association of Oilwell Drilling Contractors, New Orleans.

Tool Design

A previous article described design of hammer drills 6¾-in. or smaller. The large tool described here is essentially the same, but there are some minor differences. One difference is that it uses a heavier hammer to produce higher energy output to operate large bits.

The 8-in. hammer drill, with a 170-lb. hammer, strikes a blow of approximately 337 ft.-lb. when operating at a 275-psi. pressure drop. A 226 ft.-lb. blow is struck by the 80-lb. hammer of the 6¾-in. tool under the same conditions. Thus, the 8-in. hammer drill makes 12¼-in. hole as rapidly as the smaller tool can drill 9-in. hole, in spite of the greater area of the larger hole.

In addition to more power, the larger diameter the tool has, the more rugged construction can be.

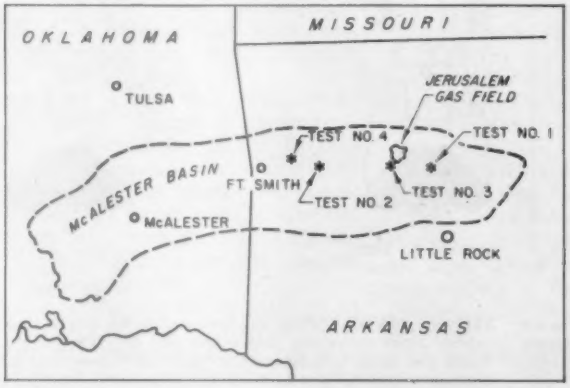
Laboratory studies show that the demand for power to drive percussion tools increases rapidly as the diameter of the hole increases. On the basis of experimental and theoretical study, Simon[3] states, "The volume of rock fractured out in rock drilling should be just about proportional to the mechanical energy input to the rock." Rate of penetration should, hence, be proportional to the mechanical power input to the rock per unit area of hole:

$$R = 2.0\ P/D^2S$$

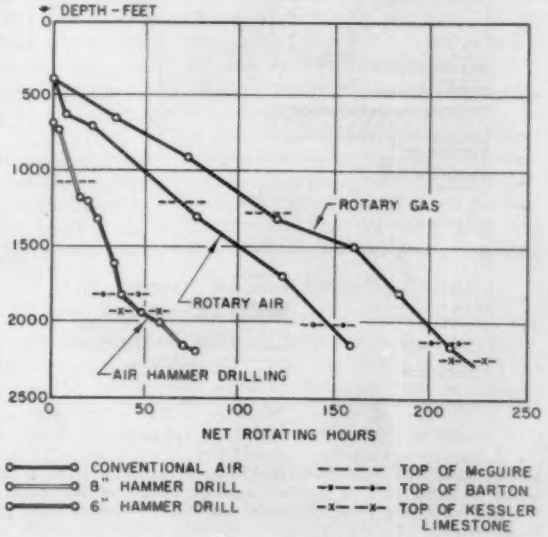
where:

P = power input into the rock, in.-lb. per second
D = hole diameter, in.

HARD ROCKS, crooked hole make the McAlester basin sites a harsh test for the new 8-in. air hammer drill. Fig. 1.



DRILLING IS FASTER with the air hammer on the first of the four tests than was air and gas drilling in comparison wells. Fig. 2.



S = drilling strength of the rock, lb. per in.[2]

Thus, to maintain a constant drilling rate, a 12¼-in. hole will theoretically require 1.85 times as much impact power as a 9-in. hole. In practice, the foot-pounds energy per blow for the two hammer sizes should not be compared directly because frequency is different.

Test-stand results indicated an advantage for large hammer drills in 12½-in. holes as shown in Table 1. Field runs in comparable lithology show the 8-in. tool better than the 6¾-in. tool.

Field Tests

The new 8-in.-diameter tool was tested in an area where drilling is extremely hard from the surface down. The four test wells shown on Fig. 1 are in the eastern end of the McAlester basin in Central Arkansas. The area is geologically complex and contains a large number of widely scattered gas pools.

In general, air and gas drilling has made exploration wells economically feasible in this area. For example,[4] one recent well saved 46% in time and 83% in bits by conventional air drilling over mud drilling to 4,903 ft. This well was in the western end of the McAlester basin in southeastern Oklahoma, where geology and drilling conditions are similar.

In Arkansas, conventional air or gas rotary drilling averages about 50% higher rates than mud.

In the four wells, the large tool drilled hole 9⅞ to 13¾-in. in diameter. A total of 4,496 ft. of hole in these sizes was hammer-drilled with 32 bits. This is compared with 2,150 ft. of conventional air and gas drilling with 24 bits.

In three of the wells, 6¾-in. or 5¼-in. commercial hammer drills were used in smaller hole below that drilled by the larger hammer drill, and there was a good advantage in drilling rate. The hammer drills of all sizes were operated at pressures ranging from 250 to 310 psi.

First test. The first well, Fig. 1, was drilled to 2,200 ft. Alternately, it used 8-in. hammer drill and a 6¾-in. hammer drill in 12¼-in. and 9⅞-in. bits. Two conclusions were made from this test:

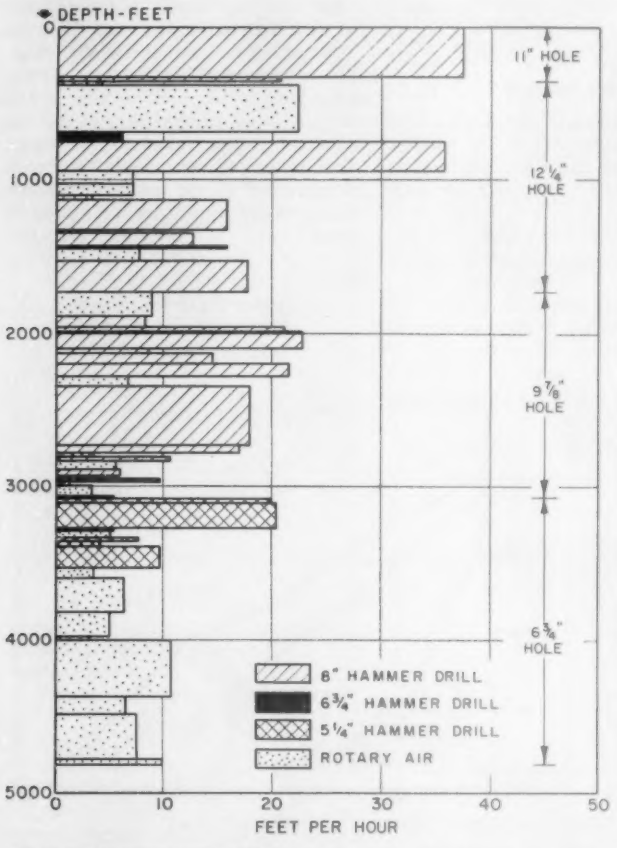
1. Combined performance of the 6¾-in. and 8-in. hammer drills was better than that of conventional air and gas drilling.
2. Because of lithologic differences drilled by each size tool, it was not possible to compare their performance.

The drilling-progress chart of this well is shown in the Jerusalem field. The 8-in. hammer drill was used very

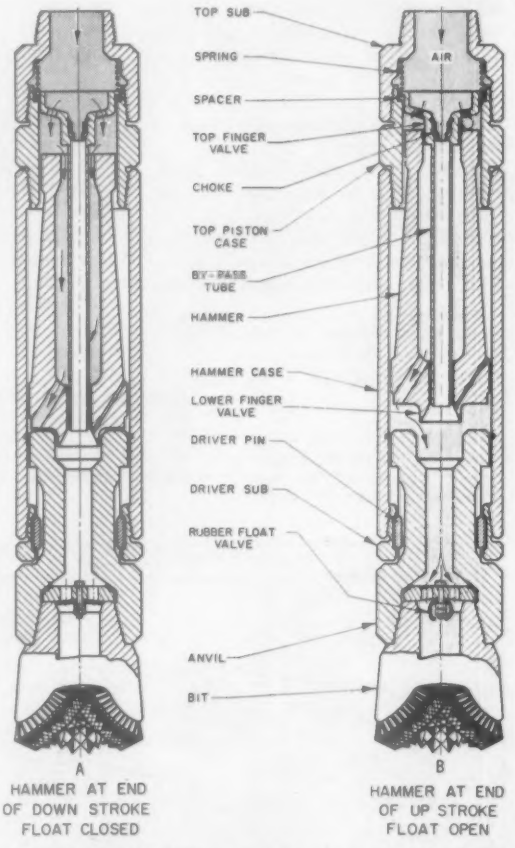
TABLE 1—COMPARISON OF DRILLING RATES

Hammer drill o.d. (in.)	Bit size (in.)	Actual drilling rate (ft. per hour)	Relative drilling rate
6¾	12¼	8.7	100
8	12¼	11.8	136

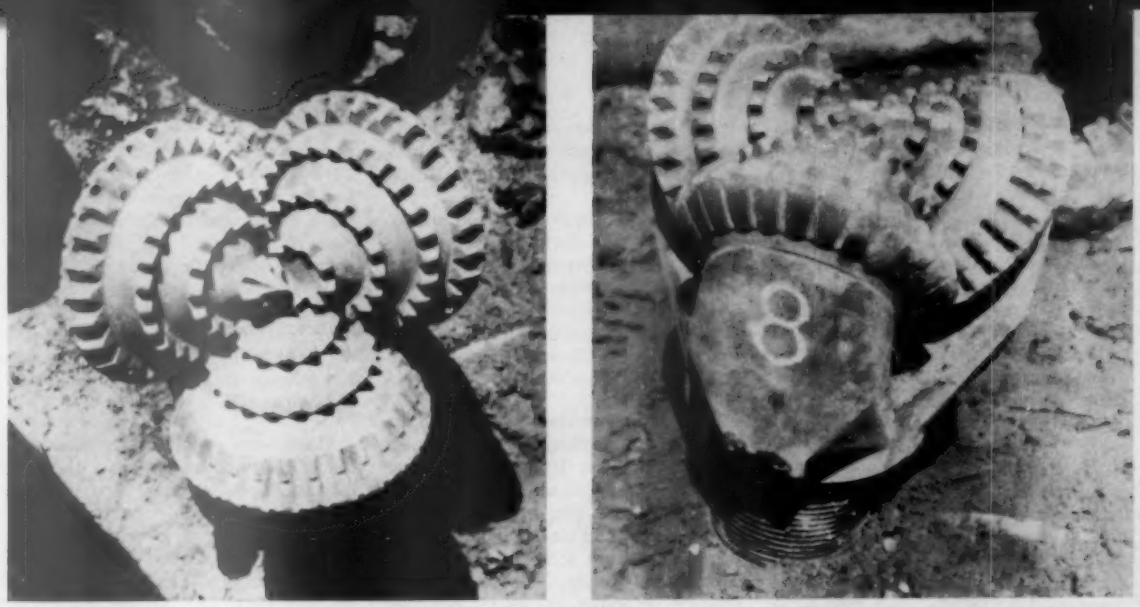
This test was made in the laboratory, drilling pink granite from Marble Falls, Tex. The air pressure was 250 psi., weight on bit was 6,000 lb., and rotary speed was 32 r.p.m.



LARGE HAMMER'S EFFECTIVENESS in large hole sizes is apparent when drilling rate is plotted against depth of the hole. Below the big hole, the small-diameter hammers showed their effectiveness. Fig. 3.



KEEPING WATER OUT of the hammer is the job of new rubber float valve run just above the bit. Previously, floats had been run above the hammer; these allowed enough water backflow to plug the hammer. Fig. 4.



LONGER LIFE FOR BITS is reward of using air hammer drill; there is less tooth wear on the bit (left) used to drill 205 ft. with hammer drill than on bit (right) which drilled only 87 ft. with air. Actually, gage wear was biggest bit problem; under hammer, bits stayed in gage longer than when hammer was not used. Fig. 5.

little after the initial run because of delay in obtaining a replacement part.

In 9⅞ and 12¼-in. hole, the two hammer drills combined to drill 1,401 ft. of hole at an average rate of 22.6 ft. per hour. Bit life was 200 ft. per bit. This compares with 1,107 ft. of conventional air drilling in the same hole size in the same well at an average rate of 13.8 ft. per hour with an average bit life of 123 ft. per bit.

Rig cost per foot drilled was $4.50 per foot when using a hammer and $6.10 per foot when using conventional rotary air. These costs are based on 15 rotating hours per day, and include a hammer rental charge in addition to the normal air rotary charge, when applicable.

No water was encountered in drilling this well; hence, it represents optimum air drilling.

Second test. The second test well was 65 miles west of the first and in an area of harder drilling. Here, the 8-in. tool drilled much faster than the 6¾-in. No wells had been air drilled in the immediate vicinity, but a nearby hole drilled with a combination of cable tools and mud rotary required three times as long to reach the same total depth.

In the second test, three drilling practices were used in drilling to 3,100 ft. The advantage of the 8-in. hammer drill was apparent at the start. To drill the first 4 ft. of an 11-in. rathole required 12 hours with conventional rotary air. The last 32 ft. were finished in 1 hour by the 8-in. hammer drill using the same bit.

In drilling a total of 2,020 ft. of 9⅞, 11, and 12¼-in. hole, the hammer drill averaged 16.3 ft. per hour and 140 ft. per bit. This can be compared with 1,047 ft. of conventional rotary air drilling in the same hole sizes at an average of 6.9 ft. per hour and 75 ft. per bit.

Calculated on the same basis as for test 1, the rig cost per foot drilled was $6.30 for the hammer drill and $11.80 for rotary air.

Fig. 3 is a progress chart of net drilling time for this well, and shows a general advantage for the bit runs in which the hammer drill was used. Drilling in this well was slowed by water in the hole.

Third test. The third test was in the same general area as the first, Fig. 1. The hammer drill made 420 ft. of 12¼-in. hole for surface pipe. This hole was completed in 58 net drilling hours. Compare this with 10 to 15 drilling days for the same amount of surface hole with cable tools, the general practice in this area.

In this test, bit weight was held to less than 5,000 lb. to avoid deviation. In spite of this very light weight and a wet hole, drilling rate was 7.3 ft. per hour.

Cable-tool drilling is cheap and may be competitive with hammer drilling but the latter has two advantages: (1) quicker completion and quicker production and (2) straighter hole while drilling five to seven times as fast.

Fourth test. In the fourth test, Fig. 1, the 8-in. hammer drill made 615 ft. of 13¾-in. hole in 74 net rotary hours, or an average rate of 8.3 ft. per hour. This is also very hard surface drilling in damp hole. Weight was held to 4,000 lb. to keep the hole straight.

In this well 615 ft. of 13¾-in. hole were drilled with the 8-in. hammer drill in 74 net rotary hours, and average rate of 8.3 ft. per hour.

When considering using the hammer drill, carefully review the drilling characteristics of the area. Where air drilling is used, the hammer drill will almost always drill faster, but the rock must be hard enough and abrasive enough that it will drill sufficiently faster to pay the extra cost of the drill.

Drilling Rates

The second test well is an excellent direct comparison between the 8-in. and the 6¾-in. hammer drill. Both were operating a 12¼-in. bit. The two tools alternated in drilling continuous hard rock from 679 to 923 ft.

The 6¾-in. tool drilled 39 ft. of hole at an average of 6 ft. per hour.

It was immediately followed by the 8-in. hammer drill making 205 ft. at an average of 35.8 per hour. In the first part of this 205-ft. run, in which the 8-in. tool was drilling in the same lithology as that drilled by the smaller tool, penetration rate increased to 38 ft. per hour. Weight, speed, and other drilling conditions were held constant.

Fig. 3 compares performance of the two tools. After the run with the 8-in. hammer drill, use of the 6¾-in. tool with 12¼-in. bits was discontinued.

Hole-Deviation Control

The test area is "crooked-hole country." Concurrent with these test wells, another well was being drilled in the area by another operator; it deviated to 24°.

In the first test well, deviation with the hammer drill did not exceed 1¼°. While drilling the second test well with the 8-in. hammer and 5¼-in. drill collars, the 12¼-in. hole deviated to

3½° at 923 ft. This was corrected to 2¾° in drilling 175 ft. with conventional rotary air drilling at light weight and high rotary speed.

The 8-in. hammer drill was then used with 8-in. drill collars. Weight was held to 3,000 lb. or less and the bit was turned at 50 r.p.m., somewhat faster than normal in percussion drilling. In 300 ft. of drilling, hole slope reduced to 1¼°.

In addition to reducing hole deviation, the hammer made an average of 16 ft. per hour, compared with 3 to 7 ft. per hour for the previous rotary air drilling at light weights.

At the end of a conventional rotary air run at 2,345 ft., the 9⅞-in. hole deviation was 2½° (measured at 2,302). The 8-in. hammer drill using the same bit brought the deviation down to 1¾° in the next 384 ft. of drilling. In this case, the conventional rotary air averaged 6.8 ft. per hour with 12,000-15,000-lb. bit weight, while the hammer drill made 18 ft. per hour with 5,000-12,000-lb. weight.

In the third test well, weight was continuous at 5,000 lb. Deviation remained less than 2¼°. In the fourth test well, at continuous weight of 4,000 lb., deviation remained under 2° except in the last hundred feet, where it increased to 3°. Because casing was set at this point, there was no opportunity to straighten the hole with the 8-in. hammer tool.

Hammer Performance

Operation of the hammer drill is simple; it requires no special skill on the driller's part. The tool is run to near bottom and air circulation is started. The weight of the anvil and bit keeps the valves open, preventing the hammer from striking the anvil.

The tool is then rotated to bottom as a precaution against drilling an out-of-round hole by percussive action. As the bit contacts the hole bottom, the lower finger valve closes to the position shown in Fig. 4A, and hammer action begins.

If the hole has standing water or accumulated cuttings, blowing-down with air should start some distance off bottom, as in conventional air drilling.

The drilling crews quickly learned to operate the tool, and after initial training needed very little help.

Down time for repair. The 4,500 ft. of test drilling was essentially free from parts failure. On the first well, one repair of the 8-in. hammer drill was required. This was a break in the anvil caused by the bits splitting in the pin, thereby splitting the anvil box.

There was no down time for mechanical repair of the 8-in. hammer drill in the last three test wells.

The hammer puts no special requirements on rig equipment that might require repair.

Air-volume requirements do not exceed those set forth in the Angel tables[5] for conventional rotary air drilling. Drill collars and drill pipe were not noticeably affected by the use of the hammer drill. The only failure of a drill-collar pin was attributed to normal wear.

Wet hole. The tests produced a solution to the problem of hammer plugging in wet holes. In the first test hole no water was encountered, so there was no tool-plugging trouble.

In the second test well, wet hole was drilled from 1,280 ft. to 4,800 ft. using foam drilling. Injection of foam solution at rates up to 10 bbl. per hour did not hamper the hammer-drill operation. However, backwash during connection time frequently plugged the hammer-drill ports with cuttings. This action required several round trips to clean the tool.

A float valve is used in the bottom drill collar in normal air drilling. In these wells, the float was carried immediately above the hammer drill. It did not keep material out of the tool, apparently because the hydrostatic head of water that accumulated in the annulus compressed air in the tool below the float valve enough to allow cuttings to enter.

Improvised float valves were tried on top of the bit in the second and third wells. These worked for short periods before failing because of the severe shock of hammer action.

In the fourth hole, a bit float valve, shown in Fig. 4, was used. The only moving part is a rubber disk that is not damaged by hammer shock. This valve successfully prevented hammer plugging while drilling surface hole in the well which was wet all of the way except for the first 30 ft.

The valve showed no serious damage afterwards. Use of such a valve is necessary to prevent hammer plugging in wet holes.

Bit Service

In a recent comparison of over 31,000 ft. of drilling, hammer-drill bit life averaged 1.3 times that with rotary air drilling. In general bits used with hammer drills in the large holes lasted from 20% to 60% longer than bits used with conventional air in the same hole.

Button-type bits used with the hammer gave excellent service. For example, one drilled 539 ft. in a well where average of all hammer bits was 113 ft.

Failures cured. In the first hole five rock bits split in the seam welds and two bearing failures occurred. Both 12¼ and 9⅞-in. bits failed. On the second hole, only one bit split in the seam welds and one bearing retainer plug was loosened. In the third and fourth holes no bits failed.

This improvement in bit service indicates that the manufacturers now have reliable bits for percussion drilling larger holes. Unfortunately, these bits in some cases cost 30% more than conventional bits.

Gage-wear problem. In nearly all cases, bits were eventually discarded for gage loss whether used with the hammer drill or in conventional air drilling. In the hard, extremely abrasive formation drilled in these tests, the rate of gage loss per foot drilled actually decreased as the bit drilled faster.

In general the percussion drills operated at less than 10,000 lb. weight and less than 50 r.p.m. Conventional air bits operated at 12,000-20,000 lb. weight and 50 to 75 r.p.m. On the basis of these tests, a hammer-operated bit loses less gage per foot of hole than a bit operated by conventional air drilling.

Fig. 5 compares two 12¼-in. bits used in similar drilling in test 2. Both bits are the same make with web-type cutter teeth, and are designed for hard abrasive formation. The top bit drilled 205 ft. of sandstone, shale, and siltstone with the 8-in. hammer drill. The bottom bit (No. 8) drilled 87 ft. of gray tight siltstone by conventional rotary air.

Moreover, the bit used with the hammer averaged 35.8 ft. per hour during its life as compared with 7.2 ft. per hour for the conventional air bit. Loss of gage on the conventional air bit was slightly greater.

These two bits are representative of all used throughout the test. They point up that improvement of gage performance for air drilling hard abrasive formation by any method could greatly extend bit life.

References

1. Howard, G. C., Vincent, R. P., and Wilder, L. B., "Development and Field Use of a High Frequency Gas-Operated Rotary-Percussion Drilling Tool": AIME—SPE Paper No. 1286-G; October 1959.
2. Liljestrand, W. E., "Use of Percussion Tools With Air and Gas": The Oil and Gas Journal, p. 88, Nov. 2, 1959.
3. Simon, R., "Drilling by Vibration": ASME, Pet. Mech. Eng. Conf., Denver, Paper 58-Pet.-21; September 1958.
4. Adam, J. H., "Air and Gas Drilling in the McAlester Basin Area": The Oil and Gas Journal, p. 123, August 12, 1957.
5. Angel, R. R., "Volume Requirements for Air and Gas Drilling": Gulf Publishing Co., Houston.
6. Liljestrand, W. E., "Percussion Drilling Tool Increases Bit Footage": Pet. Eng., July 1960.

TODAY'S GAS ENGINES

They're gluttons for work, require but little maintenance, need minimum of floor space, and have a small appetite

BY H. C. BOZEMAN
Gulf Coast Refining Editor

DEVELOPMENT of gas engines over the past 25 years has increased thermal efficiency to 37% and reduced floor area to 15% of the original. Gas turbines now show promise of meeting the current emphasis on minimum-first-cost prime movers.

Design of packaged engine-compressor units should represent the best combination of all components.

Application of engine-driven balanced-opposed gas compressors is economic where fuels other than natural gas are available.

Maintenance is reduced on turbocharged gas engines by eliminating much unnecessary disassembly for inspection.

These trends and others were discussed at a recent ASME petroleum conference in New Orleans.

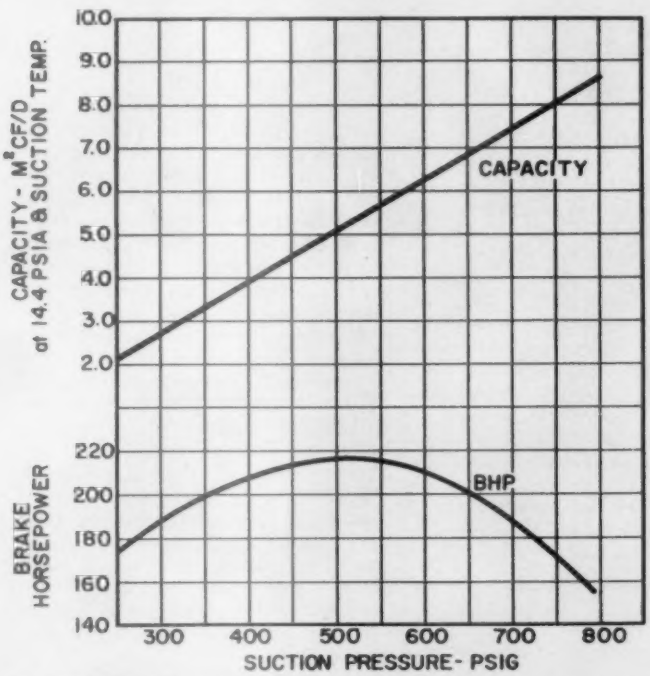
Development

Today's gas engines and the 1930 gas engines are alike in only one respect—their fuels, said R. F. Moser and R. M. Greene of Clark Bros.

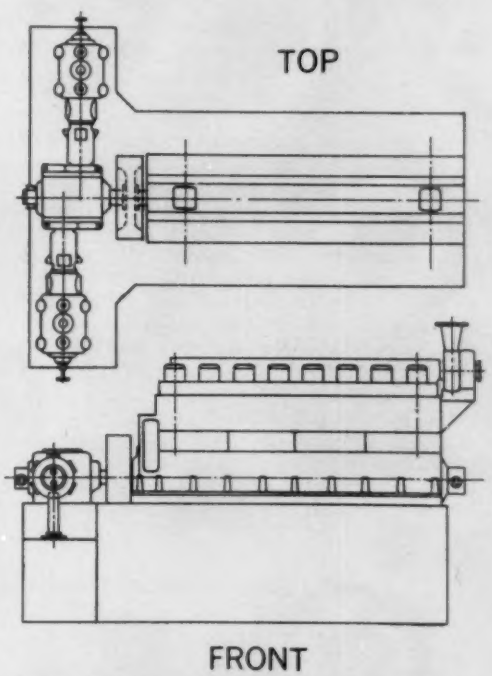
In 1930, horizontal two-cycle gas engines were patterned after horizontal reciprocating steam-driven compressors. These engines had a thermal efficiency of about 18% and were huge in relation to their power output, requiring about 10 sq. ft. of floor space per b.hp.

The first real advancement was timed injection of fuel directly into the power cylinder. Thermal efficiency rose to about 25%.

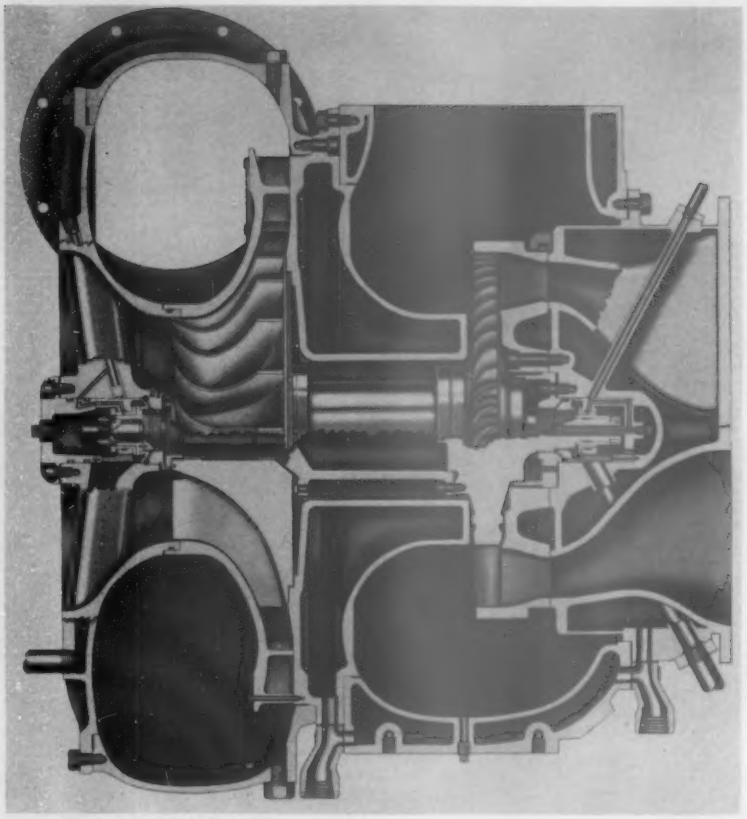
The right-angle compressor with vertical power cylinders and horizontal compressor and scavenger cylinders was developed in the 1930's. It met demands for reduced fuel consump-



GAS COMPRESSORS, size 4 by 4 by 7-in., speed 600 r.p.m., N = 1.26, elevation 300 ft., discharge pressure = 1,000 psig. Fig. 1.



TYPICAL METHOD of coupling the assembly. Engine crankshaft and compressor shaft are flanged together with flywheel sandwiched between. Fig. 2.



TYPICAL CROSS-SECTION of an exhaust-driven turbocharger. Fig. 3.

tion, operating personnel, and floor space.

World War II gave impetus to developing ignition systems for high compression ratios. Subsequent high-compression-ratio engines had thermal efficiencies of about 32%.

Turbocharging of two-cycle engines in the last decade has raised thermal efficiencies to around 37%, which is twice that of 1930. Floor-space needs were reduced to about 1½ sq. ft. per b.hp., about 15% of the original.

Moser and Greene believe that "the modern, turbocharged reciprocating engine is the most efficient, dependable source of power commercially available today."

Gas turbines. Gas-turbine selection is based currently on minimum installed cost, which results in only relatively large units being economically attractive because of low production rates.

Long-life industrial gas turbines are designed to operate for periods of 1 year or longer and have a blade life of 50,000 hours or more. Maximum temperatures are in the range of 1,350° F. to 1,450° F. Thermal efficiency of gas turbines is related to gas temperature. Although Moser and Greene see no impending metallurgical development which will soon jump temperatures several hundred degrees above the current operating range, they do forecast a yearly increase of about 10° F. by improved metallurgy and better internal cooling.

Thermal efficiency of present turbines, based on lower heating value, is 17 to 19% for the simple open cycle, and 25 to 27½% for the open regenerative cycle.

Single-shaft gas turbines are finding more use where dual-shaft turbines were used originally. The single-shaft unit does not have the speed-power flexibility, but is simpler and cost about 85% of dual-shaft turbines (see Table 1).

Operating experience shows that gas turbines are available 98% of the time and continuous operation for 12 to 15 months is not unusual. Control and auxiliary equipment cause more unplanned shutdowns than the turbines, said Moser and Greene.

TABLE 1—DUAL SHAFT VS. SINGLE SHAFT GAS TURBINES
(Per cent)

	Dual shaft	Single shaft
First cost	100	85
Variation in power for a 10° F. change in ambient temperature	7	5
Speed range available at 90% of rated load	60-100	85-100

Design

Packaged engine - compressor units should be ready to run when they leave the fabricator, need no field assembly, and require only suction, discharge, and small utility connections, said J. L. Joplin, Oil & Gas Supply, in a discussion of packaged compressor units.

He further pointed out that plunger loads are the most important limitation of compressor-power frames and should never be exceeded. Also, engine speed is of prime importance, with piston speed having no real significance. Avoid engine speeds outside the designated range.

Engine accessories were discussed and recommended by Joplin as follows: (1) Low - tension - magneto ignition, (2) oil-bath air filter, (3) engine-mounted lubricating-oil cooler to serve as an oil-temperature regulator, (4) full-flow oil filter with block valves and bypass line for changing elements, (5) bypass thermostat to control engine jacket-water temperature, (6) mechanical fly-ball governor with about 10% regulation, (7) fuel-gas regulator with stabilizing-volume bottle to supply adequate fuel at required carburetor pressure, and (8) vane-type air motor operated by 80 to 100 psi. gas to start the engine.

V-belt and poly-belt drives are used on many packaged compressors, but the latest trend is to direct-connected and gear - driven units, says Joplin. They are more compact and usually need less foundation mass, but don't generally have the wide speed range of belt-driven units.

The structural steel skid should be designed so the entire unit may be lifted from one end without any tendency to bend or buckle. All open areas should be covered with deck-plates and guards put around all belt drives and couplings. Use conduit or tubing to enclose electrical wires, cautioned Joplin. Mufflers mounted on the units should be well supported and include a piece of flexible high-temperature tubing between the engine manifold and muffler. Pressure-gages and thermometers should be connected as closely as possible to the suction and discharge or each cylinder.

A number of safety devices are usually installed to permit unattended operation for long periods, says Jop-

lin, and most of these packaged units are air cooled.

Application

Recently, there has been a reevaluation of the power-engine drive and a number of installations have been expanding along this line, said W. M. Kauffmann, Worthington Corp., in his discussion on engine-driven balanced-opposed gas compressors. These machines were used as early as 1936 in the gas industry, and were developed concurrently with the angle gas engine.

Advantages and disadvantages of the engine-compressor combination were given by Kauffmann.

Advantages:

1. Forces are balanced in four-cycle, 6 and 8-cylinder in-line engines, and 12 and 16-cylinder V-type engines. Coupling these units together offers stability and a minimum of foundation problems (Fig. 2).

2. Frame loading, piston speed, and valve velocity are the only limiting factors for selecting cylinder combinations and strokes. A long-stroke power-engine may be connected to a shorter-stroke compressor, for example.

3. Unitized frame and housing construction of the gas-delivery end offer shorter and more compact compressor manifolding and snubber layouts.

4. Fuel economy at rated full load of 6,300 to 6,400 B.t.u. per b.hp.-hour may be based on full-diesel compression-ratio with spark-ignition operation. Power engines are built for using a number of liquid and gaseous fuels from process operations and can be dual-fuel or trifuel.

Fuel consumption is reduced 5 to 10%, based on diesel-compression-ratio, by high-pressure turbocharging and cooling of air charge to the power cylinder.

5. Reduced maintenance is anticipated from greater accessibility to engine connecting rods and bearings from both sides, and compressor running-gear from the top side.

Disadvantages:

1. Tandem arrangements may increase the width and length of the compressor station and foundation spread.

2. Relative cost of the engine-compressor unit is about 5% greater than an angle unit of equal power.

3. Mechanical efficiency of the combined units of 81% over-all, 90% for the engine and 90% for the compressor. The angle unit has a nominal mechanical efficiency of 83%.

Maintenance

Maintenance of engines is generally getting worse instead of advancing with design, and more emphasis is needed to apply available instruments, tools, and training to field maintenance, said J. H. Caldwell of Cooper-Bessemer.

Certain signs and indications of turbocharger operation can be used to predict when overhaul is needed or to guard against failure. These checks can be made without removal and disassembly which in itself may result in premature failure. Caldwell gave a checklist for making observations of turbocharger operation at h o u r l y, daily, monthly, and quarterly intervals.

Here are some of the more important points given in Caldwell's checklist for four types of turbocharger installations:

Two-cycle exhaust-driven. The most important check is the air manifold pressure available to the cylinders. Each observation should be made at the same load condition. Begin observations when the unit is in good operating condition, after initial installation or an overhaul.

A daily change of 0.4 in. of mercury may be caused by atmospheric-pressure changes. If the pressure increases daily, there is strong indication that cylinder ports are beginning to clog and detonation will follow. As ports clog, the exhaust temperature will rise, which may be noticed before the manifold pressure rises. Retarded ignition also may cause increase in exhaust temperature and higher air pressures.

A decrease in manifold pressure may only confirm costly damage to the turbocharger. Other indications give warnings before decreased manifold pressure is noticed.

Inspection windows on the air-inlet pipe to the turbocharger give a visual means to check operation. Spindown, freeness, and end-play checks will show if carbon is forming behind the turbine disk.

Turbocharger vibrations is another important c h e c k. Instruments are available for measuring the slightest amount of vibration and close observation alone is often sufficient.

Observation of cooling-water inlet and outlet temperatures, exhaust temperatures, and air-intake pressure gives other important clues to turbocharger operation.

Four-cycle exhaust-driven. The parts for the four-cycle turbocharger are the same as the two-cycle, although the two are designed differently. Thus, the maintenance checklist can be the same as previously listed with a few additions.

Faulty control is sometimes indicated by an increase in air manifold pressure above normal. When a decrease in air manifold pressure occurs, tappet clearance may be insufficient. Intake or exhaust valves may be leaking also.

Series-turbocharged. These units apply to both two and four-cycle units. The first stage of combustion air is supplied by turbochargers and the second stage by gear or belt-driven compressors.

In trouble-shooting series units, an induction air-pressure gradient record from the air filter to the engine manifold is useful. Analysis of the records, for the same load conditions, show the stage that has a ratio lowest from normal is faulty.

The maintenance approach to the first stage is similar to the two and four-cycle turbochargers. Second-stage compressors usually have ball bearings and hydraulic couplings, and can use spindown tests, but ball-bearing maintenance procedures are usually used.

Parallel-turbocharged. This unit has two sources of combustion air. One is an exhaust-driven turbocharger and the other is a reciprocating scavenging piston. They have separate suction piping but discharge into a common air manifold via an aftercooler.

Detonation is reached sooner with less port clogging than other units, and a lower corresponding rise in air-manifold pressure. The problem is to find which source is faulty. Examine the turbocharger first, using the same techniques as for the two-cycle turbocharger. If it is in good condition, check the scavenger system. A good check on its operation is to watch for increasing amounts of crankcase oil in scavenging-air passages and scavenging drains.

Favorite Topic:

How to Cut Costs

EVERYONE at the big API meeting in Chicago next week will be talking or thinking about ways to cut costs—one of the most urgent problems now facing the oil and gas industry.

The Journal will devote a special section to this important subject in its Annual Pre-API Issue of November 14.

Read next week's special Journal report and join the corridor conversations with fresh ideas on how to cut costs in drilling, production, pipelining, and processing.

HOW TO REDUCE DRILLING COSTS: PART 6

How to select bit weight and rotary speed

BY PRESTON L. MOORE
University of Oklahoma

IN northwestern Oklahoma today, there are companies spending $135,000 to drill and complete a 7,500-ft. Morrow sand gas well. In the same area, others pay as little as $75,000 for like wells.

Obviously, there must be some difference in practices since the $135,000 well is no better than the cheaper one. A large part of the difference in this case is the bit weight and rotary speed used. Some operators have computed costs and experimented with weight and speed. Result is lower well cost.

This discussion covers how weight and speed should be determined for lowest possible cost.

The two previous parts of this series showed that drilling rate increases with increases in either or both bit weight and rotary speed. Although the exact mechanisms of fracturing rock under pressure are not known, the above results are generally accepted by industry. It is also known that the magnitude of either bit weight or rotary speed depends on the specific drilling operation. For example, drilling rates also depend on removing cuttings from below the bit, which in turn depends on hydraulic horsepower and type of drilling fluid in use. That is, in some way all factors that affect drilling rate and cost must be considered when selecting bit weight or rotary speed.

For the time being, let's assume that cuttings are being removed instantaneously with their generation. Using this assumption simplifies the problem of selecting proper bit weight and rotary speed. Relative to bit weight, two factors must be considered: over-all economics or total cost per foot of hole; and hole problems, primarily crooked hole.

In general the rotary speed selected is a function of bit weight.

Assuming no crooked-hole or other hole problems, bit weight is selected on the basis of economics only. In this respect, there are many ideas on the proper method to select bit weight and rotary speed. In 1958, Speer presented a method for determining optimum drilling techniques, which included a method of selected optimum bit weight and rotary speed.[1] This information, based on a large amount of field data, was a very good approach for the individual operator analyzing his own drilling information.

Today in soft-rock areas, bit weights are higher than those used 2 years ago, because hydraulic and fluid programs are better. As a result, the operator using this approach must continually reevaluate data to determine the optimum bit weight or rotary speed.

Others have based optimum bit weight on bearing wear. In this approach, penetration rate is assumed directly proportional to bit weight and proportional to rotary speed to some power less than 1. Bit life is assumed inversely proportional to rotary speed and bit weight to some power greater than 1. These relationships are shown in Equations 1 and 2:

$$R = kN^aW_1, \text{ where } a < 1 \quad (1)$$

$$\text{Bit life} = \frac{k'}{NW^b}, \text{ where } b > 1 \quad (2)$$

A detailed development using these basic relationships was presented by Moore[2] in October 1958. Graham and Muench presented more detailed development and additional information;[3] their work included the calculations of optimum bit weight and rotary speed using assumptions shown in Equations 1 and 2. This work is a good approach if all phases of the drilling operation are being conducted on an optimum basis. For example, the drilling fluid must not contain abrasive material, cleaning below the bit should be complete, and all bit bearings should wear the same on each bit run. In most drilling operations, these basic requirements are not met.

As a result, the relationship given in Equations 1 and 2 are always representative of actual conditions. Many times an increase in bit weight does not reduce footage per bit as shown in Equation 2. In fact, it may actually increase the number of feet per bit, again depending on changes made in other phases of the drilling operation.

A new approach to selecting bit weight and rotary speed has been offered by Hughes Tool Co. Its method includes a planned and progressive increase in bit weight and rotary speed during the life of the bit. Charts for general use with this method are being prepared and will be presented to industry. Hughes claims that tests with this method increased penetration rates and bit life by 20% in one field; reports from other areas indicated favorable results. Although this method may not necessarily be the final answer to selecting bit weight and rotary speed, it apparently is a sound means to consider.*

The selection of bit weight and rotary speed by some means is necessary. One tour may make an arbitrary decision to use 30,000 lb. on a given size bit. Another tour may use 50,000 lb. on the same size bit. Such practices cost the contractor and operator money. Thus, whatever system is used, it should be a planned one.

Of more importance than initial selection of bit weight and rotary speed is keeping records to determine the cost per foot of hole. It is not enough to follow some system because it seems to offer a means of decreasing costs "for many wells." For any specific rig operation, hydraulics, choice of bits, and fluid properties may be different from some generalized case. As a result, bit weight and rotary speed must be selected on the basis of operating cost per foot for the specific rig in question.

Considered in total cost. The cost per foot of hole is:

$$\text{Cost } (\$/\text{ft.}) = \frac{\$/\text{bit} + \$/\text{rig-hour } [(\text{hrs./trip}) + (\text{rot. hrs./bit})]}{\text{ft./bit}} \quad (3)$$

This equation does not include the cost of additional drill collars needed when bit weight is increased, nor does it consider additional wear and failure of drill pipe and drill collars. These, however, are costs that should be considered after the cost in dollars per foot has been found using Equation 3. If too many cost functions are con-

*The Hughes paper describing this method will appear in next week's Journal with H. B. Wood and E. M. Galle as authors.

After months of intensive work, a research team in Standard Oil's research center next to our Whiting, Indiana, refinery developed a remarkable new gasoline additive—called *M.PG.*—that improves car performance. Working on an experimental engine are research scientists (left to right) Norm Esau, Dick Sholts and Bob Malec.

How scientists turned gasoline into a mechanic's helper!

From the day in 1911 that scientists in a Standard Oil laboratory discovered the secret of efficiently mass-producing gasoline by cracking oil molecules, they have continually sought new ways to make it do more than just move a car.

Today, thanks to scientific ingenuity, gasoline does much more.

Just recently, for example, scientists in Standard Oil's research center developed a new additive—one that turned gasoline into a mechanic's helper! True, it can't change fan belts, but what it *can* do is a pretty good trick in itself!

Under ordinary traffic conditions, varnish-like deposits collect in carburetor throats. Engine performance becomes erratic; idling is poor. As time goes on, the deposits become more difficult to remove.

The new additive discovered by Standard removes such deposits. Called *M.PG.*, it was developed after months of painstaking work in Standard Oil's research center. Months of field tests followed the laboratory work. And, in a driving test conducted with a fleet of taxis in Minneapolis, it was found that *M.PG.* not only reduced deposits in dirty carburetor throats, but also improved M.P.G. (miles per gallon) 6.8% because of the greater efficiency obtained from clean carburetors. Translated into miles, 6.8% is 680 additional miles for every 10,000 driven! *M.PG.* now is in Standard's GOLD CROWN and RED CROWN gasolines.

Such leadership in scientific development is nothing new at Standard. Standard Oil was a pioneer in degummed gasoline, de-waxed motor oil, and many other improvements. For 70 years, Standard research scientists have been making contributions to petroleum progress, searching continually for ways to make oil *more useful to more people than ever before!*

What Makes a Company a Good Citizen?
One gauge is a company's usefulness ...its contribution to the general welfare. Through research, Standard constantly strives to develop products that will strengthen America's defenses and help millions of people in their work, in their homes, and on the road—today and in the future.

STANDARD OIL COMPANY
(INDIANA)

THE SIGN OF PROGRESS... THROUGH RESEARCH

Teletype Model 28 punched tape units

The Teletype Model 28 tape reader and typing tape punch combine proved dependability of operation with a variety of features which help streamline data communications systems and save the time of attendant personnel.

• *Convenience.* On the Model 28 tape reader, a single 3-position start-stop lever controls "on," "off," and "freewheeling." A specially designed tape lid, conveniently hinged, will accommodate either chadless tape or fully perforated tape, without intermediate adjustment.

The Model 28 tape punch not only perforates intelligence into tape—it simultaneously "prints out" the data right on the tape, thus greatly facilitating handling and storage.

• *Low Maintenance.* Both units are designed for extremely low maintenance, with all-metal clutches that require oiling only once or twice a year, depending on usage.

• *Reliability.* Teletype tape equipment is the product of extensive research and precision manufacturing facilities. It is made for continuous, day-in, day-out service with minimum upkeep. Teletype Corporation manufactures this equipment for the Bell System and others who require the utmost reliability from their data communications systems.

Typing Tape Punch

Tape Reader

Send-Receive Page Printer

Automatic Send-Receive Set

FREE Model 28 line folder. Write Dept. 94-L, 5555 Touhy Avenue, Skokie, Illinois.

TELETYPE®
CORPORATION
SUBSIDIARY OF *Western Electric Company* INC.

sidered in the initial calculation there can never be a clear-cut decision on the cheapest approach. The reason is obvious: There is always a way to point out how higher bit weight caused a twistoff and fishing job or how the additional drill collars were the cause of sticking drill pipe.

The problem must be approached with a sincere desire to improve, discarding any petty differences among personnel, and keeping a record of the cost in dollars per foot as bit weight or rotary speed is changed. Then, the best possible bit weight and rotary speed can be found.

A sample problem. Here is an example to illustrate the calculation of cost per foot using Equation 3:

Well depth: 5,000 ft.
Formation: dolomitic limestone.
Anticipated hole problems: none.
Bit cost: $200.
Rig cost: $50 per hour.
Bit size: 8¾-in.
Bit weight: 50,000 lb.
Rotary speed: 90 r.p.m.

Trip time = 0.5 hr. + (0.133 hr./drill-collar stand) + 0.5 hr. per 1,000 ft.

Wt. of drill collars in air: 85 lb. per ft.

Hydraulics are adequate for complete cleaning below bit.

Avg. rotating time: 10 hrs. per bit.
Avg. feet per bit: 240.
Mud weight: 9.0 lb. per gal.

With this information in hand, we calculate the effective weight of drill collars immersed in fluid:

Wt. eff. = wt. air (1 − 0.015G).

Where G = mud weight in lb. per gal.

Thus: Wt. eff. = 85 (1 − 0.015 × 9) = 85 × 0.865 = 73.5 lb./ft.

From this, we need this many collars:

$$\frac{50{,}000 \text{ lb.}}{73.5 \text{ lb./ft.}} = 680 \text{ ft.}$$

At 90 ft. per drill-collar stand, we would need a minimum of 7.55 or **8 stands.** Then, our trip time is:

Trip time = 0.5 hr. + 0.133 × 8 + 0.5 × 4.28 = 3.7 hrs.

And, resulting cost of drilling becomes:

$$\text{Cost/ft.} = \frac{\$200 + \$50\,(3.7 + 10)}{240}$$

$$= \frac{200 + 685}{240} = \$3.70$$

As a comparison, assume that bit weight is cut to 25,000 lb. and rotary speed remains unchanged. Rotating time increases to 24 hours, and footage per bit to 288 ft. Collars needed in this case are:

$$\frac{25{,}000 \text{ lb.}}{73.5 \text{ lb./ft.}} = 340 \text{ ft.}$$

Drill-coller stands = (340 ft./90 ft. per stand) = 3.8 = 4 stands (minimum needed):

Trip time = 0.5 hr. + 0.133 × 4 + 0.5 × 4.28 = 2.53 = 3.17 hrs.

$$\text{Cost/ ft.} = \frac{\$200 + \$50\,(3.17 + 24)}{288}$$

$$= \frac{200 + 1{,}358}{288} = \$5.40$$

Based on this analysis, each foot of hole at 5,000 ft. costs $5.40 when drilling with 25,000 lb. on the bit. When drilling with 50,000 lb. on the bit, each foot costs $3.70. This is a typical field situation with a reasonable difference in cost per foot between drilling with 25,000 and 50,000 lb. of bit weight.

At higher bit weights, there may be considerably more wear on bearings. However, when an analysis such as this is made, it becomes clear that higher bit weights should be tried in many cases and the costs per foot calculated. In practice, other costs such as pump repair and rig maintenance must be considered. With any new program, rig costs may increase initially as a result of a change in practices; these costs should level off as crews become familiar with changes.

Rotary speed of 90 r.p.m. and 50,000 lb. of bit weight were chosen because this generally represents a good starting point for shallow wells. Further tests might indicate a need for more bit weight and a reduction in rotary speed. At 50,000 lb., the weight per inch of bit diameter is 5,715 lb. Weights as high as 9,000 lb. per in. have been used in many wells below 7,500 ft.

This simple approach, if used properly, is the best available for determining optimum bit weight and rotary speed. Other methods provide the starting point only and are not necessarily the optimum levels of bit weight and rotary speed.

Crooked hole. Unfortunately in final selection of bit weight, economics is only one of the factors that must be considered. The other is crooked hole. As bit weight increases, the tendency for a hole to deviate is increased. In almost all of the major drilling areas of the world, particularly below 5,000 ft., there are problems with crooked hole. As a result, drilling progresses with reduced bit weights and higher than normal rotary speeds.

In many of these operations, no attempt is made to stabilize drill collars and limits on hole deviation are less than 6°.

No attempt will be made here to discuss drill-collar stabilization. The material presented by Woods and Lubinski on stabilization is very good and should be used to space stabilizers if crooked hole is a problem. There is no doubt that their procedures for spacing stabilizers minimize crooked-hole problems and allow use of more bit weight. Failure to use this information and stabilizers, when needed, costs the operator money.

As important as stabilization is the need for a relaxation of straight-hole requirements. Control the rate of deviation, say 1° per 500 ft., but allow the hole to deviate up to some maximum around 20°. By allowing use of more bit weight, this practice would substantially lower drilling costs by increasing penetration rates in many areas.

What weight, speed? This discussion has not outlined the specific bit weight or rotary speed that should be used. A general range on bit weight is from 5,000 to 9,000 lb. per in. of bit diameter. Rotary speed depends on bit weight. At low bit weights (below 5,000 lb. per in.) rotary speed may be 120 r.p.m. At high bit weights (above 7,500 lb. per in.) the rotary speed may be below 60 r.p.m.

First emphasis should be on using the highest economical bit weight that can be safely used without exceeding straight-hole requirements. Rotary speed should then be a function of bit weight and bit wear.

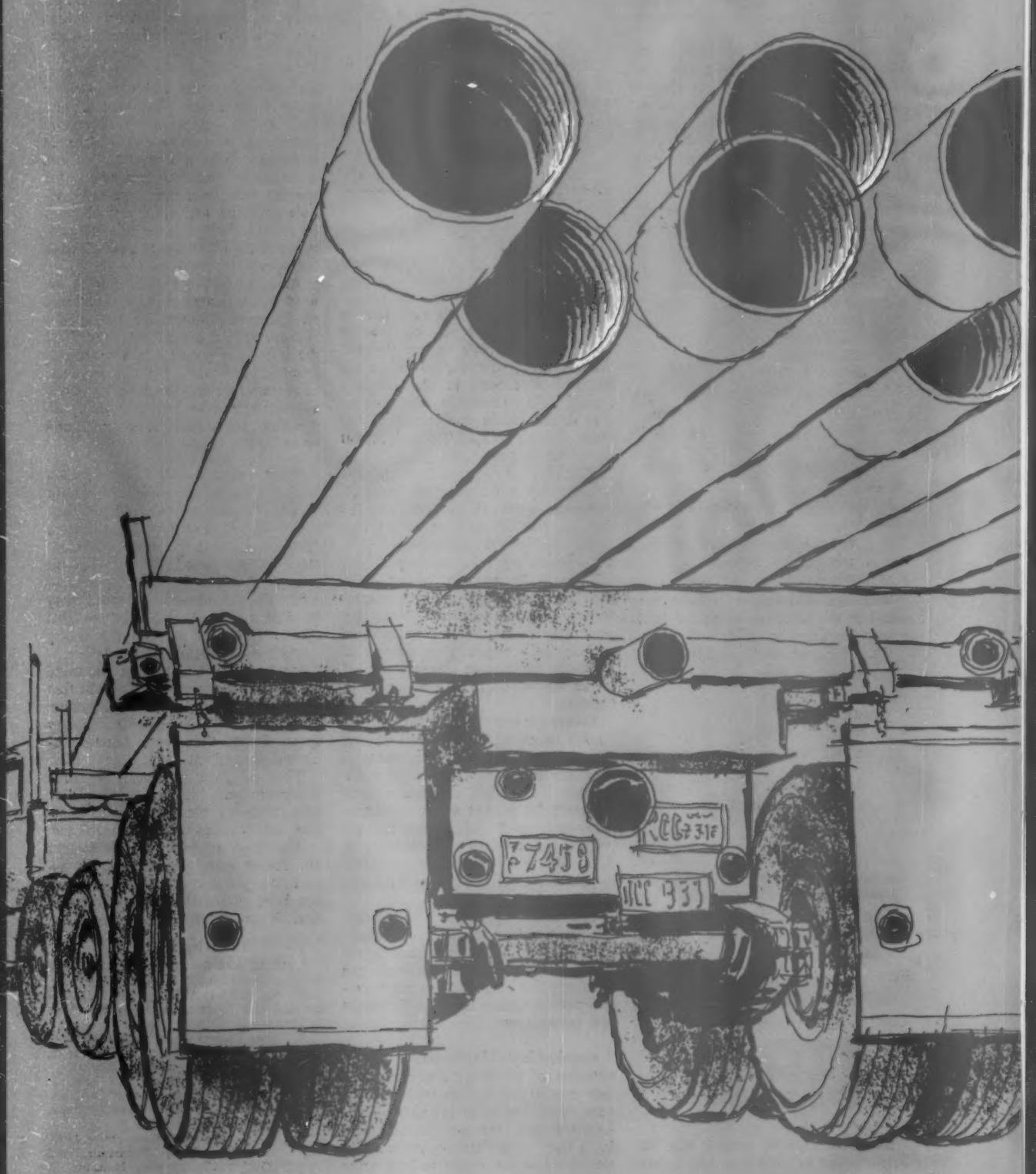
That is, if bit weight is at some maximum and bits are being pulled with worn-out teeth and good bearings, rotary speed should be increased.

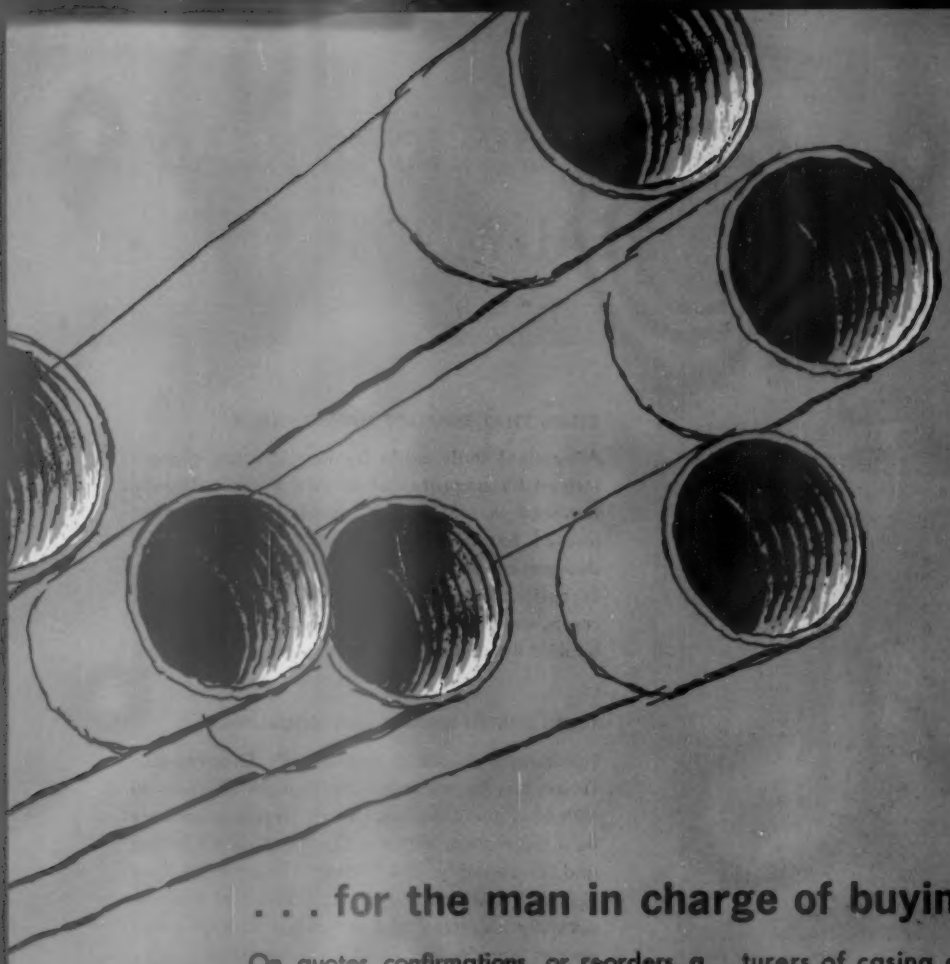
The final selection of bit weight and rotary speed depends on the actual cost per foot of hole. The range has been given; the final determination is an individual responsibility.

References

1. "A Method for Determining Optimum Drilling Techniques," by John W. Speer: Paper No. 926-3-1, API Houston, 1958, The Oil and Gas Journal, March 31 and April 7, 1958.
2. "Five Factors that Affect Drilling Rate," by Preston L. Moore: October 6, 1958, issue of The Oil and Gas Journal.
3. "Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations," by Graham and Muench: Paper 1349-G AIME, Dallas, 1959.
4. "Keys to Successful Competitive Drilling," by Bobo, Hoch, Boudreaux, and Angel: Gulf Publishing Co., Houston.

A NEW REPUBLIC SERVICE





. . . for the man in charge of buying pipe

On quotes, confirmations, or reorders, a new Republic service saves you valuable time. Multimillion dollar electronic facilities make it possible to return quotes within the hour . . . enter and confirm your order within the day. Data is "memorized" so that you can reorder pipe quickly and easily.

Under this new data processing system, district sales offices are linked to centrally located service centers.

One of the world's largest manufacturers of casing and tubing, Republic maintains an unsurpassed system of quality control. In addition, you will find a broad casing and tubing line . . . customer-conscious mill and field inventories . . . expert metallurgical and design assistance.

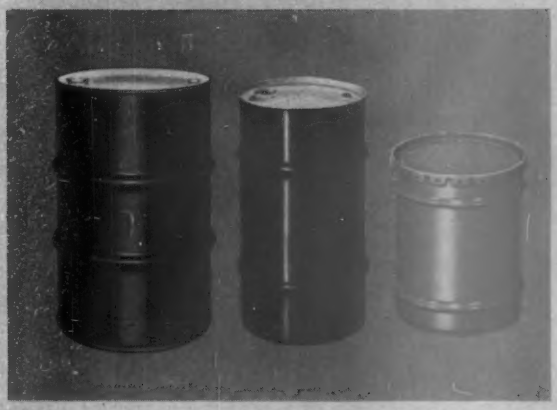
Let us give you a quote within the hour. Direct inquiries to your nearest Republic sales office. For general data on Republic Casing and Tubing, mail the coupon on the following page.

ELECTRIC WELD AND SEAMLESS TUBING: 2⅜", 2⅞", and 3½" O.D. in H-40, J-55, or N-80. ELECTRIC WELD AND SEAMLESS CASING: 4½", 5½", 6⅝", 7", 7⅝", 8⅝", 9⅝", 10¾", and 13⅜" O.D. in H-40, J-55, N-80, or P-110. Buttress Threads available in 5½", 7", 7⅝", and 9⅝" O.D.

REPUBLIC STEEL

Cleveland 1, Ohio

Electric Weld • Seamless • Fusion Weld • Continuous Butt Weld
Light Wall • X-TRU-COAT • Plastic Pipe



REPUBLIC IS READY, READY WITH...

STUDS THAT SIMPLIFY MAINTENANCE

Alloy steel studs made by Republic are characterized by accurate, full-formed threads. Usually furnished in AISI 4120 Chrome-Moly Steel, heat treated to ASTM A193, designation B-7, or in designations B-14 and B-15 for higher temperatures. Exceptional high strength eliminates danger of creep, stretch, or fatigue-failure. Send coupon for booklet listing types, and complete specifications.

TUBING WITH SNAP-TIGHT COUPLINGS

Lightweight Republic ELECTRUNITE® Grooved-End Tubing has the strength—the strength of steel—to withstand dents, slashes, and ruptures in temporary field installation. Victaulic Couplings speed joining and disassembly. ELECTRUNITE is produced from highest quality carbon steel, grooved at the mill, carefully inspected and controlled through every step of manufacture. Send for information.

ELECTROSTATICALLY LACQUERED DRUMS

Lacquer-lined drums available from Republic assure peak protection for your product. In Republic's ELECTRO-LAC Process, a fine lacquer mist is dispersed from a high speed distribution head. This mist is uniformly attracted (as a result of an electrostatic field produced in the drum) over the entire interior. Thin spots in the coating are eliminated. Ask your Republic Container salesman for details or mail the coupon.

REPUBLIC STEEL CORPORATION
DEPT. OG-1281
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:
☐ Republic Casing and Tubing ☐ Alloy Studs
☐ ELECTRUNITE Grooved-End Tubing
☐ Lacquer-Lined Drums

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

LOCATIONS of new plants to be built during Japan's second 5-year stage petrochemical - development program. Kawasaki is presently Japan's largest petrochemical center.

Japan set for second-stage project

JAPAN'S petrochemical industry finally achieved its first 5-year program with the completion of Japan Synthetic Rubber Co.'s plant at Yokkaichi, Mie Prefecture. The new plant began production in April of this year, using butane as a starting raw material.

A total of $228 million was spent under this first-stage program which started construction in 1955. This included $34.9 million paid to foreign countries for royalties, licenses, know-how, and engineering fees, and $22.6 million for imported equipment, mostly from the United States.

Participated in by 13 major chemical and petroleum-petrochemical companies, the Japanese petrochemical industry today can produce approximately $220 million worth of products, amounting in value to almost 7% of total output of the country's chemical industries.

The future prospect for growth in demand is also bright and the petrochemical industry is taking giant steps toward its second-stage project, which is estimated at $300 million. This second stage is characterized by the following features:

BY K. KUROKAWA
Tokyo Correspondent

1. The number of participating companies will be doubled. Among the powerful newcomers are Toa Nenryo Kogyo K.K. (55% owned by Standard - Vacuum Oil Co.), Showa Denko K.K., Nitto Chemical, and Shin Nippon Chisso K.K.

2. Diversified products are proposed in contrast to the first stage which predominantly manufacture the ethylene series of products. Propylene, in particular, is attracting keen attention.

3. Polyethylene is still growing in demand as reflected in the proposed capacity increase and new installations will be made by various companies.

4. New plants will be grouped by several Zaibatsu (financial combines such as Mitsui, Mitsubishi, and Sumitomo), and localities which are being centered around six areas:

(a) Kawasaki center—Nippon Petrochemical (main), Showa Petrochemical, Furukawa Chemical, Asahi-Dow, Japan Geon.

(b) Kawasaki center (new) — Toa Nenryo (main), Nitto Chemical, Showa Denko.

(c) Yokkaichi center—Mitsubishi Petrochemical (main), Mitsubishi Kasei, Japan Synthetic Rubber, Daikyo Oil, Showa Yokkaichi Oil.

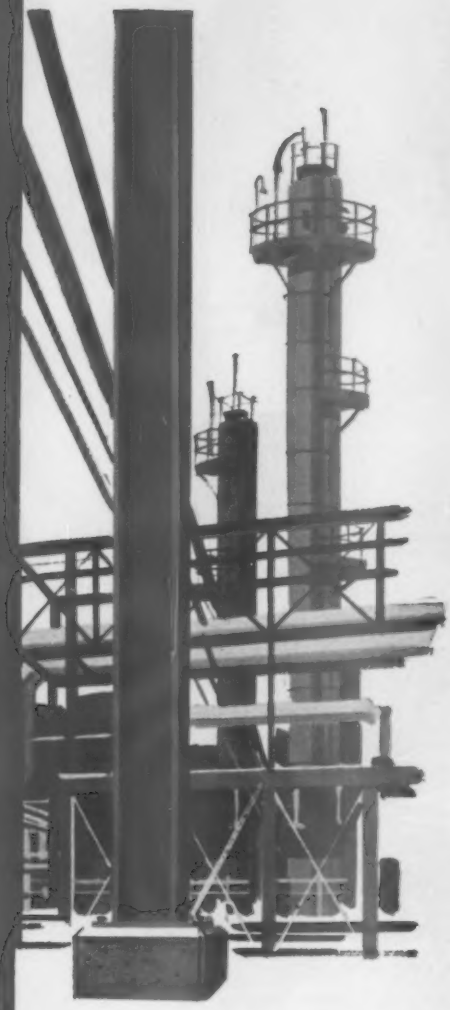
(d) Iwakuni center—Mitsui Petrochemical (main), Koa Oil.

(e) Niihama center — Sumitomo Chemical (main).

(f) Goi center (new)—Maruzen Oil (main), Shin Nippon Chisso.

(g) Mizushima (new) — Mitsubishi Oil (main), Kurashiki Rayon, Mitsubishi Kasei.

Foster Wheeler *Heat Engineered* products, plants and processes... for the world's industrial progress.



Best foundation for process profitability

What is the best insurance that your new process plant will produce "as planned"?

When Foster Wheeler is your "planner" there is experience with the design, construction and start-up of 75 different processes—in more than 800 plants throughout the world—to provide a sound basis for every detail.

This experience covers every conceivable operating condition: temperatures, pressures, corrosion, erosion and others. The problems of equipment design and world-wide procurement have been met and solved, over and over again.

When Foster Wheeler designs, engineers and constructs your process plant, *experience* is the foundation for process profitability.

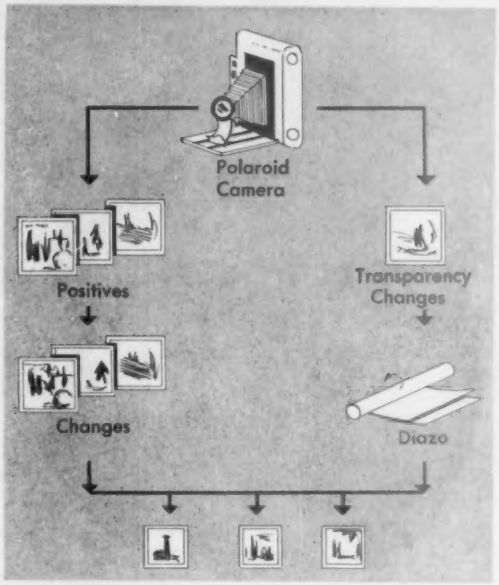
FOSTER WHEELER

NEW YORK LONDON PARIS ST. CATHARINES, ONT.

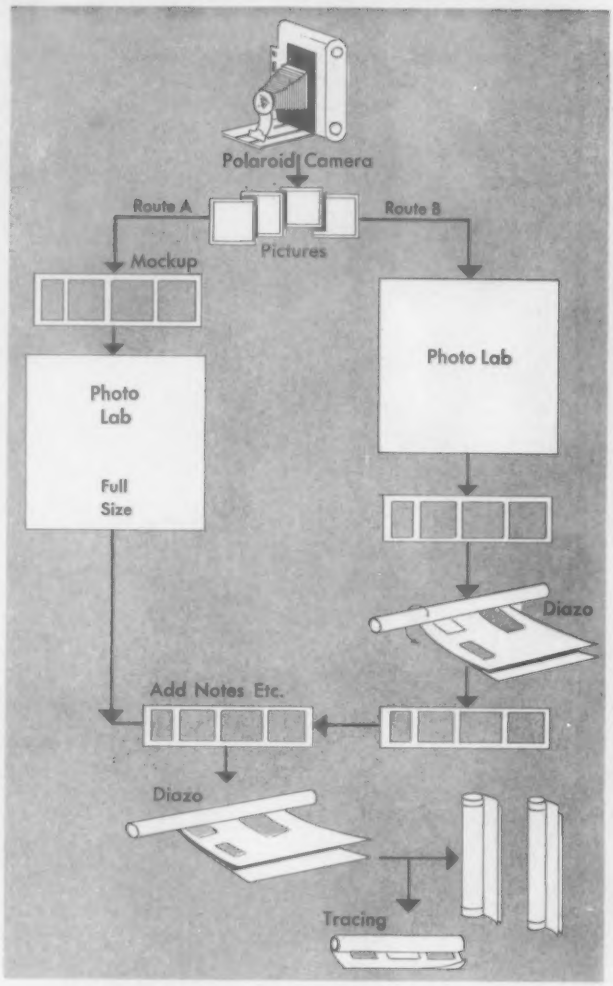
Fig. 2.

Photography is used in the design analysis of test machinery, to study and improve work methods, to illustrate reports of engineering tests, and help explain maintenance and operating orders.

Fig. 1.



Presentation can be informal, like this . . .



or "full dress," like this, depending on need.

Photodrawing: Hard-working assistant in plant engineering

BY R. J. TILLER
Senior Engineer
Monsanto Chemical Co.
St. Louis

PHOTOGRAPHY is used to produce engineering plans that are more informative and more easily understood than conventional drawings, yet require 20 to 60% less design time and cost.

One of the most important applications of engineering photography is photodrawing. This is the technique of using photographs, with drafting additions, to convey engineering information in the same manner and purpose as orthographic engineering drawings. It is most often used to design equipment modifications.

Selected photographs of the equipment are reproduced on a translucent drafting material. Drafting modifications, notes, descriptive, and dimensional data are added. Blueprints or diazo prints are made in the usual manner.

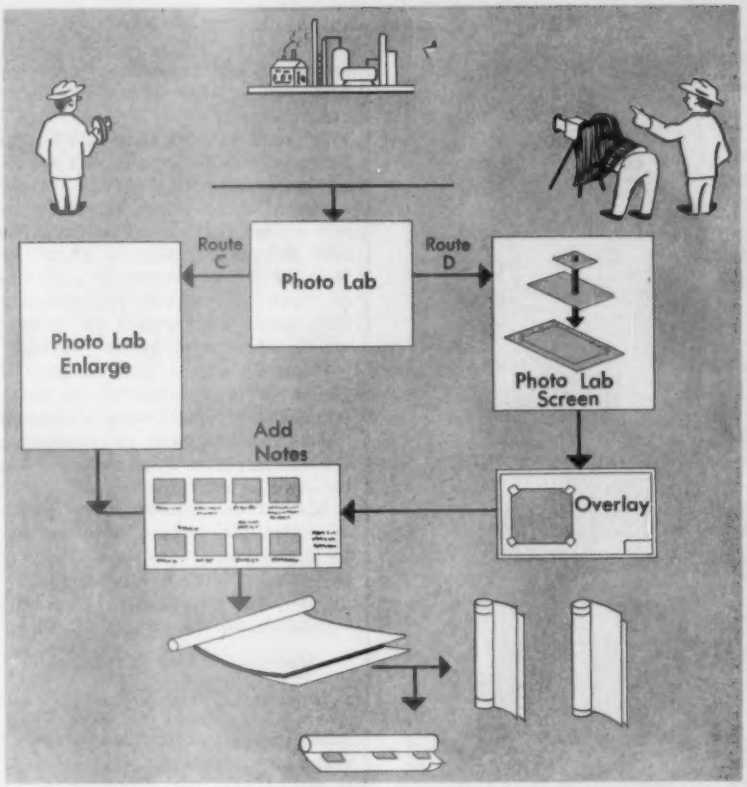
Paper presented at ASME petroleum mechanical conference New Orleans, 1960.

When properly applied photodrawings can:

- Save design time with 20 to 60% fewer man hours.
- Cut design costs 20 to 60%.
- Show more information than is possible or practical in orthographic drawings and sketches.
- Save time. Updating record drawings is sometimes longer and more expensive than actual design of modifications.
- Record every detail of the plant and provide an accurate base on which to show changes and additions.
- Transmit design information realistically.
- Lower construction costs because less engineering supervision and interpretation is required in the field.

But there are some disadvantages too:

- Professional-quality work may require professional photographers and laboratory facilities. The expense is seldom practical except where there



HERE'S FORMAL PRESENTATION of film camera. Fig. 3.

are already photographic departments that can expand to handle the engineering work.

However, photodrawings can be made without professional photographic talent and equipment. In many organizations, engineers and draftsmen take the pictures and use continuous-tone enlargements to produce photodrawings.

● There are other minor disadvantages, but these are usually temporary. For example, personnel are reluctant to try something new and different. In addition, they may need to develop some new skills, particularly to take acceptable pictures and make drafting additions in the same perspective as the picture. This requires some practice and experience.

Planning Use of Photographic Techniques

Once a decision is reached to use the photodrawing technique, it is management's task to plan in detail the methods and procedures. There are many possible methods of producing photodrawings and each method can be varied.

Select and devise procedures that make maximum use of existing equipment and services as well as personnel talent and interest. Any additional equipment must be within the means and budget of the organization.

The procedure must produce the quality and quantity of photodrawings dictated by the type and volume of engineering work.

Basic steps: The basic steps of making photodrawings are:

1. Take the pictures.
2. Select the views and plan their arrangement.
3. Print the selected pictures to the desired enlargement on sensitized drafting material.
4. Add descriptive and dimensional information by normal drafting methods.
5. Make and distribute the necessary prints.

Choose among the various means of doing each step to plan photodrawing procedures. Here are five ways to illustrate methods and procedures.

Study the basic steps first. Then select one of the procedures to accomplish each step. Where desirable, a variation may be obtained by selecting and combining steps from several of the procedures illustrated, Figs. 1, 2, and 3.

Selection should not be based solely on the equipment and facilities now available to the organization. Consider the simplest method that produces results.

Results may vary on individual projects. Be prepared then to vary procedures to obtain the wanted results.

Informal presentation with the Polaroid camera is rapidly gaining favor in organizations where draftsmen and engineers take the pictures. Very little photographic talent is required. Results can be checked on the spot and additional pictures may be taken until the desired results are obtained.

Plant censorship and proprietary security are made by easy examination of the developed pictures.

Informal presentation of pictures is used for reference prints of single snapshots marked with grease pencil. They are used for minor modifications where little or no record is required and to clarify verbal or written instructions. The only equipment is a camera or a camera and a diazo machine, Fig. 1.

Formal presentation with the Polaroid camera can be done in two ways. Polaroid pictures can be used to produce full-size photodrawings of multiple images. Resolution of these images on drafting base material is indiscernible from images of film cameras.

They are used where it is necessary to depend on a commercial shop to process the basic photodrawing. Engineering equipment consists of a camera and a diazo machine. Route A, Fig. 2, uses a photographic laboratory with a large camera to copy and enlarge the 11 by 17-in. mockup to a 22 by 34-in. D-size drawing.

A large contact screen of 100 lines to the inch is used or an engineering photographic film with a built-in screen of 133 lines per inch. A vacuum frame holds the halftone screen during exposure in contact with the engineering photographic film.

Route B, Fig. 2, uses a minimum of dark-room facilities for small enlargements of individual pictures. The enlarged positive transparent prints are reproduced on direct positive dry photosensitive (NH_3 developed) polyester-base drafting film using only the commonly available diazo machine.

Photodrawing procedures that minimize dark-room services are desirable. It serves to reduce delay between drafting, planning, and delivery of the basic photodrawing, ready for drafting. It reduces delay or interruptions in the draftsmen's work.

Company photographic dark-room services are more desirable than a commercial shop or other company locations. If photographic service is slow, draftsmen and engineers revert to old methods.

Formal presentation with film cameras has photographic quality far surpassing engineering requirements, Route C, Fig. 3. It is best adapted

Congrats and $25 to Mr. D. J. SUGGS, Republic Natural Gas Co., Tipton Bldg., Pauls Valley, Okla., for this quip.

Joe Roughneck is top kick of the industry . . and plenty tough in his pipe demands.

He likes the plus factors he gets in using Lone Star electric weld pipe: convenient source of dependable supply, overnight delivery and rigid quality control through exacting multiple tests.

Sound, strong, lasting pipe you can depend upon: API casing, tubing and line pipe from Lone Star.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

©1956 Lone Star Steel Company

Lone Star STEEL COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

to centralized engineering organizations with a large volume of modification projects.

It requires extensive dark-room facilities within the company or exceptional commercial service. A minority of those using this procedure rely on the engineer or draftsmen to take the photographs. A slight majority of the organizations keep one or more professional photographers busy taking the pictures and preparing the photodrawings for drafting.

Route D, Fig. 3, was common in earlier stages of photodrawing development. It is rapidly being abandoned because development of photosensitive drafting base materials eliminates the need of overlays.

Blurred diazo prints were caused by differential expansion of the two separate sheets. Overlays presented problems in filing two pieces of tracing paper fastened together. Their separation caused loss of record.

Decision to Use Photographic Techniques

The use of engineering photography is a matter for management decision and planning.

A management decision to use photodrawings must be based on an understanding of the limitations of photodrawings; where they are profitable; how they compare with present methods.

Practice of photodrawing can have a far reaching effect on the organization. It can alter project work procedures, engineering facilities, department budgets, design costs, and personnel needs.

Photodrawings are most profitable in engineering design of modifications to existing facilities. Here are some types of work where the technique is useful: piping changes and additions; equipment and machinery installations, removal, relocation, alteration assembly, disassembly, or repair; ventilation and duct work; electrical conduit, switchgear, and lighting; instruments; site clearance; structural alterations or additions; railroad trackage, roads, and storage areas.

Starting Use of Photographic Techniques

The use of photodrawings must be established by demonstration and not by decree. A decree to use photodrawings would require a directive to use them on all projects or a directive setting forth all project conditions and cirmumstances in which photodrawings would be used. Neither type of directive is possible and such an attempt would indicate a complete lack of understanding of photodrawing applications and advantages.

There are no specific criteria and no generally applicable quantitative analysis of cost, time, and labor savings that can be presented as rules for the use of photodrawings on all projects and in all situations. A limited amount of data and cost analysis has appeared in the literature. These are results of individual studies and, although indicative, they should not be generally applied. Study the articles listed in the bibliography, not to find rules for the application of photodrawings, but to sharpen ability to recognize project situations where photodrawings will be advantageous.

The extent to which photodrawings may be applied increases with experience. The cost and savings of photodrawings over orthographic methods vary with the photodrawing method.

Few design modifications can be presented entirely with photodrawings. Design drawings normally consist of one or more photodrawings and the remainder of orthographic drawings. The photodrawings normally contain detailed orthographic additions to the photographically obtained views and elevations. Photodrawings present tie-in details more clearly and at savings in design labor. Construction personnel quickly find the tie-in points and perform the work without questions to supervisors or engineers.

Determine the use of photodrawings on the characteristics of each individual project. There is no change in the designer's thought process in which he determines each plan view, elevation, section, etc. The difference in photodrawing is that the designer now determines which of the necessary views can be produced photographically.

The tool may be introduced to an engineering organization by trial application in an instance of the most obvious photodrawing advantage.

Here are some applications of photography:

Reference snapshots reduce the number of field trips.

Photography is used in the design analysis of test machinery, and to study and improve work methods, production procedures, quality control, etc.

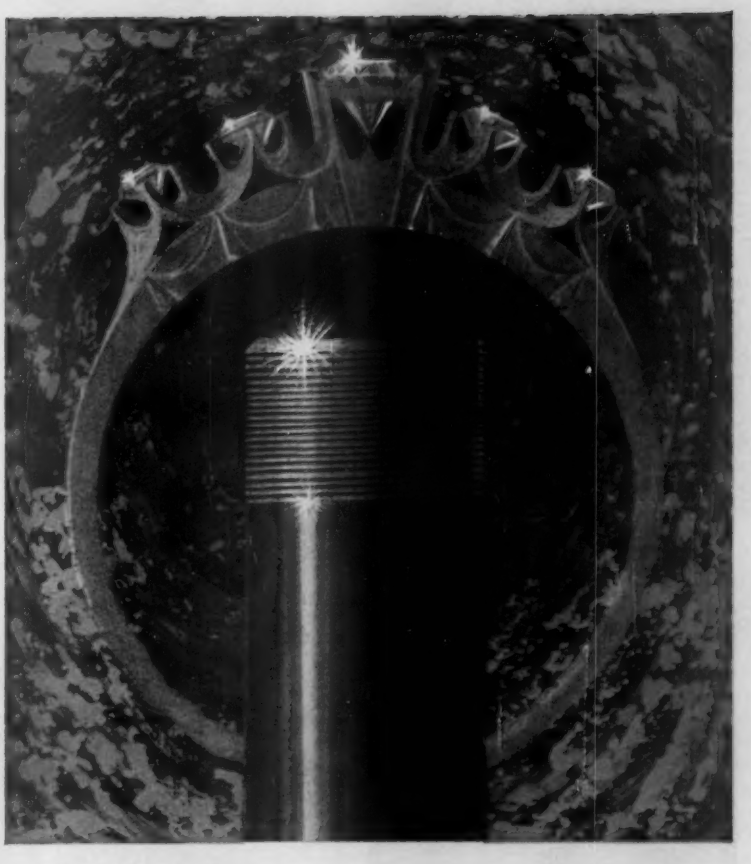
Photographs illustrate reports of engineering tests, inspections, construction, equipment damage, and training manuals.

They help explain maintenance and operating work orders.

They produce a new tracing original by copy of parts, sections, and views of other tracings.

Photography is used for microfilming of drawings.

Photodrawings are used in place



GEM
OF THE
OIL AND GAS
INDUSTRY

Threads on Lone Star API casing, tubing and line pipe are cut with custom-jewelist precision.
Lone Star men are more than mere steelworkers . . they are true craftsmen. They take personal pride in their work and in their fine products.
Oil and gas men, on the other hand, appreciate Lone Star pipe because it is a fine, dependable product, and because its convenience and availability right here in the oil country save much precious time. Truly . . the gem of the oil and gas industry.

Lone Star STEEL
COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

"Few design modifications can be presented entirely with photodrawings."

of conventional orthographic projections.

Personnel will be able to observe the advantages obtained and become interested in applying this technique in other situations. Photodrawing will then become an enthusiastically accepted practice.

Beginners can profit greatly from the experience of others by studying the references listed in the bibliography. Photographic equipment manufacturers and suppliers of engineering reproduction materials can supply excellent advice on equipment and materials.

Photodrawings are yet another tool that can be used to improve efficiency and effectiveness of an engineering organization. Like any tool, it should be properly applied. Each project should be examined for areas in which photography can improve design communications.

Photography will never completely eliminate draftsmen or the use of orthographic drawings. It is, however, a powerful engineering tool that will more effectively use scarce technical manpower and, through clearer communication of design intent, improve quality of engineering design and construction.

Acknowledgment

Partial use is made of the vast amount of information and data obtained in a recent survey of engineering practices in the chemical industry. Many companies freely contributed nonproprietary information and allowed the author great freedom in observing and studying their engineering organizations, objectives, methods, and procedures. The help of these organizations is gratefully acknowledged.

Bibliography

1. Foulke, W. C., "Some Uses of Photography in Engineering: ASME paper 57-A-155.
2. "Cut Piping Modification Cost": Heating, Piping, and Air Conditioning, October 1954, p. 101-103.
3. Schmidt, G. C., "Photodrafting Techniques": Graphic Science, Nov. 1959, p. 7-9, 20-24.
4. Maguigan, H. P., "Photography-Engineering Design Tool": Reproduction Engineer, June 1957, p. 8-9, 25, 31.
5. Hammond, G. P., Kinstler, R. C., "Let Photography Speed Your Drafting": Chemical Engineering, May 19, 1958, p. 161-165.
6. Tucker, T. C., "Photo-Drawings of Scale Models Speed Draftsman's Job": Industrial Photography, Dec. 1957, p. 28-29, 67.

IMPROVES REFINERY DIGESTION

A refiner recently asked us to help him reduce some of the expenses of operating his cracking tower. The symptoms were fast erosion of the tower itself, and costly catalyst loss in the form of fines. When Houdry engineers dug into the problem, they disclosed evidence strongly in favor of using a less erosive catalyst.

KAO-SPHERES, Houdry Mineral Kaolin Cracking Catalyst in spherical form, were recommended. It took only a very short period after turnaround to show that the remedy was working. Catalyst loss was much less than before, and the smooth, KAO-SPHERES—because they have no sharp edges—also helped reduce erosion of the tower.

Perhaps our many services—in research, engineering and manufacturing—or our catalysts or chemicals can help you in a similar way.

Why not find out?

*HOUDRY PROCESS CORPORATION
1528 Walnut Street, Philadelphia 2, Pa.
*Houdry means Progress...through Catalysis

MS 2542 0-57 AMS 15557

ENGINEERING SPECIFICATIONS COPIES:

SHEET 1 OF 1 DATE February 2, 1959 — MAINT. SUPV. C. Nelson

JOB NUMBER B-2147-32 — ENG. SUPT. F. Gurney

JOB TITLE Permanent Marking of Motor Control Center — G.Groves (Picture)

ENGINEER Hammond FOREMAN J.Dougal — A.Clelland

SCHEDULED February 6 STARTING TIME 8 A.M. P.M.

HAZARDS This work will be done while starters are in operation. Open Starter door if drilling is necessary.

REFERENCE Polaroid picture of panel attached.

MATERIALS 3/4" x 2" black plastic name tags attached with metal screws.

WORK Attach name tags in place of card holders on starter doors of motor control center in West Switch Room. Use card holder frame for pattern to drill name tags.

Name tags to be engraved as follows and installed as shown in picture.

1. Lighting Transformers
2. 80 Ton Air Conditioner
3. 80 Ton Air Conditioner
4. Circulating Pump - Zone A
5. Belt Conveyor - Zone A
6. Centrifuge - Zone A
7. Circulating Pump - Zone B
8. Belt Conveyor - Zone B
9. Centrifuge - Zone B

A MARKED PHOTOGRAPH attached to a job-specification form gives the craftsman better information. Fig. 1.

Photography is a good maintenance tool, too

BY C. B. HAMMOND
Engineering Superintendent
Monsanto Chemical Co.
St. Louis

PHOTOGRAPHY to replace written instructions and drawings is particularly suited to plant maintenance. It is no longer necessary or practical to rely on verbal instructions and crude sketches to relay information to field crews.

The three-dimensional effect of photography, coupled with its clarity, makes objects recognizable quicker than an orthographic projection.

The principal uses for photography in plant maintenance are to reduce the amount of drafting work and to provide better information for supervisor and craftsman. The Polaroid camera enables the nonprofessional to take advantage of this graphic medium at reasonable cost and with minimum of training.

To obtain best results, some experience and judgment are necessary.

There are many applications where simplified drawings are quicker and more descriptive than photographs. But, there are many jobs in the plant that can be done better, cheaper, and quicker by adding photographs to the job information.

[1] Presented at ASME petroleum conference New Orleans, 1960

Polaroid Camera

The advantages of a Polaroid are low initial cost, easy operation, and quick results. The first investment in this medium of communications can be less than $100. A camera and some film are the prime requisites.

A person with box-camera experience can learn to operate the 60-second camera with about 20 minutes' instruction. The major feature is the 60-second interval between snapping the shutter and having a finished print.

It assures the photographer that exposure and distance settings and composition are correct. If the faster films are used, it is not necessary to use a flash attachment in most plant areas.

It is convenient to have a finished print on the spot to make notes or to show critical dimensions.[1]

The major disadvantages are small picture size and lack of a negative. The standard camera produces a 3¼-by-4¼-in. print which is too small in many cases. One alternative is to retake the picture on standard film using the 60-second picture as a guide.

A second alternate is to make a negative from the 60-second print. A third is to supplement the 60-second print with drawings or sketches of detail work.

Photographing Minor Repair Work

Photographic definition of minor repair work helps the engineer, foreman, and craftsman. It is helpful to the maintenance engineer to develop the habit of carrying a camera on his area inspection trips. The pictures taken are marked to show the location, job to be done, and crafts involved.

These pictures are clipped to the repair-order or job-specification form, Fig. 1, and turned over to the scheduler or area foreman.[2]

The foreman finds the picture helpful in defining the scope of the work and in choosing the best craftsman for each assignment. He can also group similar jobs together and send a crew to repair a number of like jobs in a given area. It is particularly suited to such jobs as valve repairs, piping replacements, and minor building repairs.

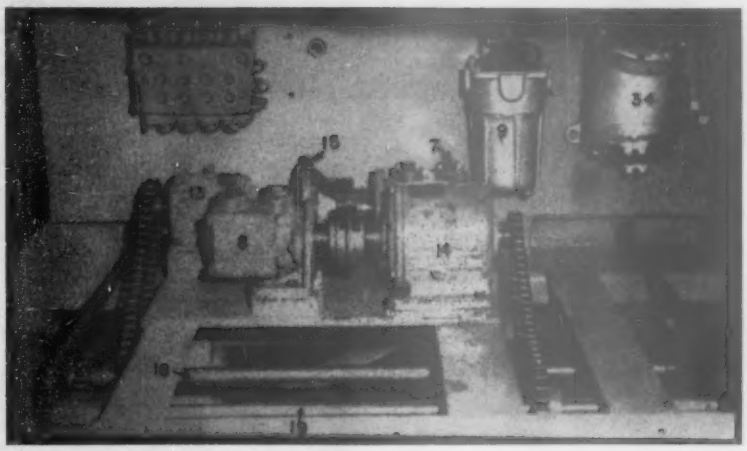
The usual problem is not doing the work; it's finding it.

Another advantage is assigning work to shift people who may not have as close supervisory coverage as the day crew. With photography, the craftsman has a clearer assignment, and it improves the use of shift and

PHOTOGRAPHS of special tools are used to illustrate maintenance procedures. Fig. 2.

PICTURES of equipment failure as they happen provide useful information. Fig. 3.

PICTURES of special equipment identify components and provide maintenance information. Fig. 4.



emergency crews. The craftsman is usually receptive to the technique and makes more effort to understand a photograph than a drawing or written instruction.

By studying the picture prior to leaving the shop, the craftsman can determine what tools are required and occasionally parts that may be needed to effect the repair. At Monsanto, the building-repair crew uses these pictures to find the amount of cement and brick for masonry repairs and the amount of plaster for wall and ceiling work. These materials are prepared in the shop and taken to the job before the mason has seen the work.

Photographing Major Repair Work

Photographs can be used to illustrate and record many phases of major repair work.

For emergency work, the engineer is able to save time by using Polaroid prints to show dismantling as a guide for later reassembly. These prints also help schedule the number and sequence of crafts.

Repetitive jobs are improved by maintaining a file of pictures showing special aspects of the work. A series of crayon-marked prints shows repair in sequence, making it unnecessary to have the same craft people do the work each time.

Pictures of special tools, rigging, and scaffolding help reduce amount of supervision and save time in job preparation, Fig. 2. Photographs of failures help engineers redesign or revise equipment. These pictures also are of value when the equipment manufacturer consults on repair problems, Fig. 3.

A major repair of process equipment presents a chance to inspect machines and facilities that are not accessible normally. Pictures showing the effect of wear and corrosion can document justifications for future repairs and replacements.

A series of pictures showing progressive failures is helpful to find potential life of the equipment and selecting a more suitable replacement.

Repair work sent to outside shops often involves frequent trips to check status and quality. These trips can be reduced by sending one man with a camera to record the work for later appraisal by interested groups. Also, pictures are used to establish capabilities of outside shops.

Photography on New Installations

Photographs are used in many stages of a new installation, first as a guide in preparing drawings, and during the installation to document revisions or deviations from the drawings. Finally, the pictures show as-installed condition.

Pictures are marked to show lubricating requirements, adjustment of linkages, frequency of inspections, and illustrate operating and safety orders, Fig. 4.

Also, the same pictures can be used in engineering reports, local newspapers, and employe publications.[3]

References

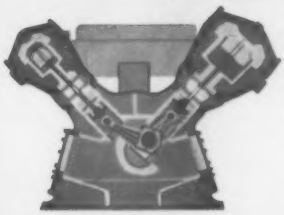
1. Smith, J. H., "On-the-Spot Photodrawings": Graphic Science, Vol. 2, No. 3, p. 21-22, 27-29, Mar. 1960.

2. Foulke, W. C., "Some Uses of Photography in Engineering": ASME paper 57-A-155.

3. Mellett, A., "Construction Photography on St. Lawrence Power Project": Civil Engineering, Vol. 28, p. 251-53, April 1958.

Will your next Y-type compressor have all of these

HIDDEN VALUES?



Frankly, it won't! Twenty-four of the values contribute to Worthington Y-type compressor performance. The other is fictitious—to see if you know enough about compressor quality to identify it. See page 233 for the *real* fictitious feature.

As you decide which 24 values are real, remember that they're not the obvious characteristics that show up on pressure gauges or price tables. They are true "values" that reveal themselves in your maintenance records ten years hence—when you find out that "those Worthington's are least expensive to run." Next time you specify a compressor, please see your local Worthington representative. Worthington Corporation, Compressor and Engine Division, Buffalo, N. Y. 36-9

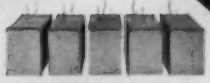
WORTHINGTON

$1,000,000 ADDITION TO LABORATORY assures sound equipment designs based on actual research.

COMPOSITION TEST determines constituents of molten iron in each ladle before any casting is poured.

OPTIC COMPARATOR is used to check connecting rod bolt threads for uniform angles, lead and form.

MAGNAFLUX AND MAGNAGLO inspections are widely used to expose surface imperfections.



PARCO-LUBRITING of critical wearing surfaces completely eliminates most start-up scuffing problems.

2000 CRAFTSMEN, these units built by same men who design and build large 5000 hp, 15,000 psi units.

COUNTERWEIGHTED CRANKSHAFT eliminates vibration and insures a smoother operation.

SELF-CLEANING OIL FILTER turns continuously to insure clean oil for pressure lubricating system.

ACCESSIBILITY – valves, packing and main parts are easily observed and reached by operators.

FAST SHIPMENT– two-stage 100-125 psi units are continuously stocked items, for quick shipment.

WATER-COOLED CRANKCASE keeps oil and compressor running gear at proper temperature.

CAPACITY CONTROL by-pass unloading, cool-operating suction valve unloaders, 3 step or 5 step option.

INTEGRATED DIV. includes foundry, manufacturing, sales, service and engineering in one location.

DESTRUCTION TEST of complete compressor cylinders verifies engineers' design calculations.

ASME DESIGN INTERCOOLER of straight tube construction externally mounted, is readily accessible.

CHOICE OF DRIVE – Flange mounted, Multi-V belt or direct coupled with tapered shaft, easy mounting.

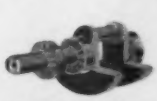
ARTICULATED CONNECTING ROD reduces crankshaft length, reduces weight and gives fewer parts.

FEATHER VALVE – industry's preferred compressor valve—is efficient, quiet, and low in maintenance.

SALES AND SERVICE INTEGRATION recognizes kinship of one to the other. One man administers both.

HONING of connecting rod crankpin and crosshead pin ends results in tighter fits, no loose shells.

PROFILOMETER inspection of highly finished parts assures easy break-in and long life.



ADJUSTABLE ROLLER MAIN BEARINGS feature low friction losses which help to extend compressor life.

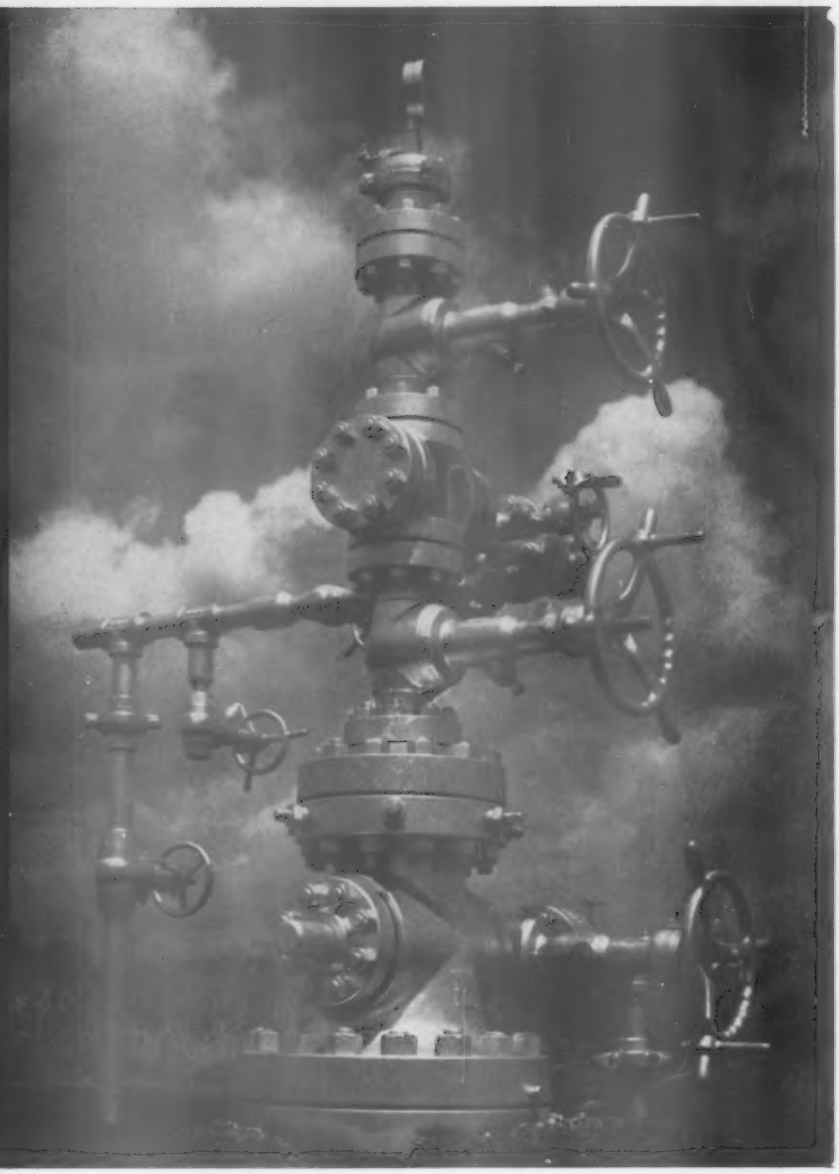
PACKAGE UNIT shipped assembled—factory alignment unchanged and no field adjustment needed.

REMOVABLE DOWEL locks piston rod to crosshead—prevents turning due to loosened crosshead nut.

ULTRASONIC TEST – an advanced method of examining certain critical parts for internal quality.

ORBIT VALVES

for CHRISTMAS TREES and General production service for extra years of service



ORBIT VALVES ARE ENGINEERED AND BUILT FOR CONTINUOUS HEAVY DUTY SERVICE WITH LOW COST MAINTENANCE

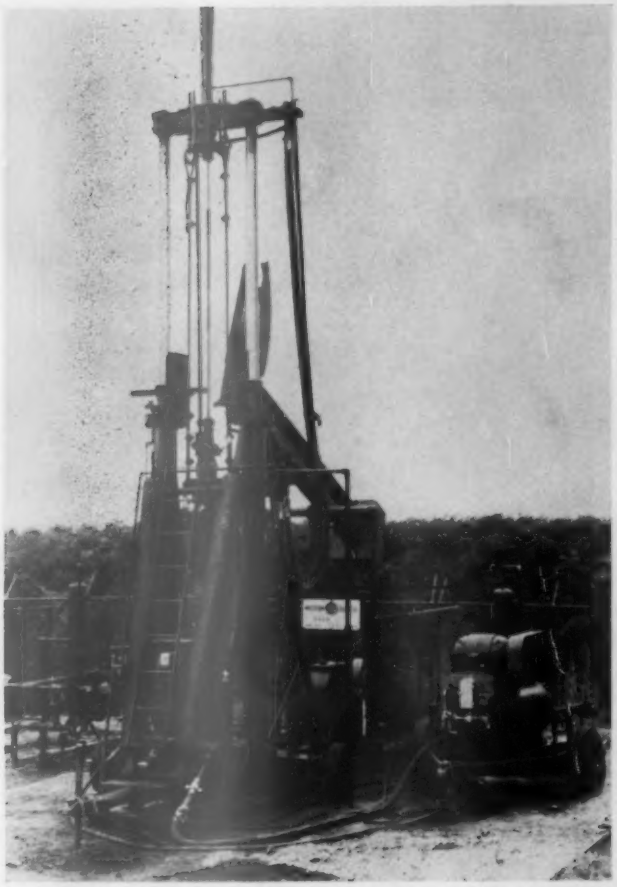
Write for Catalog 58-A covering Orbit Valves for Christmas Trees and General Production Use.

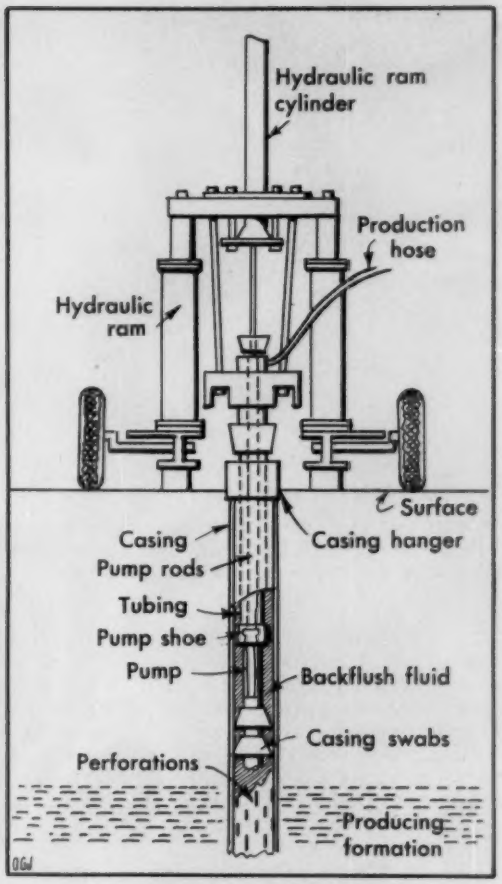
ORBIT VALVES

ORBIT VALVE COMPANY

P. O. BOX 699, TULSA, OKLAHOMA

PHONE LUther 4-4761, TWX TU 925





PRODUCTION STIMULATOR developed by Joe Beckett, Western Gulf Oil Co.'s production foreman at Fruitvale, Calif., gives wells a mild backflush and keeps perforations from plugging.

New stimulator keeps wells producing

. . by treating them with a mild backflush to prevent perforations from plugging

BY CARL J. LAWRENCE
West Coast Editor

A VETERAN California production man has come up with a new way to maintain production in wells troubled with plugging.

Joe K. Beckett, production foreman for Western Gulf at Bakersfield, has invented what he calls a "production stimulator." The stimulator is designed to treat wells with a mild backflush to prevent perforations from plugging.

What it does. The stimulator works like a plunger, lifting the tubing 8 ft. above the surface, then lowering it to the original position. Swab cups attached to the tubing string just above the perforations force well fluid in the annulus between the casing and tubing through the perforations and into the formation.

Beckett's stimulator is only one of many methods and tools available which will reverse the fluid flow and keep perforations clean, but his is believed to be the first which automatically reverses flow while the well is producing.

The unit has been used successfully on shallow wells in Yorba Linda field in the Los Angeles Basin. Five of six wells treated responded satisfactorily.

Production in one Yorba Linda well jumped from an average of 37 bbl. of fluid daily during the last half of 1958 to 100 bbl. daily during the third quarter of 1959. The increase came after 27 days of downswabbing with Beckett's stimulator. In another well, production increased from 2 to 10 bbl. daily after treatment.

The unit is now being modified for use later this year in Fruitvale field where Beckett is now working.

Beckett's theory. Continuous plugging of wells at Yorba Linda led Beckett to perfect the stimulator.

Conventional plugging treatment achieved limited success. The wells would produce for short periods, but would not maintain their flow over a long period, and continuous treatment by conventional backflushing ran the risk of casing collapse, or water shutoff failures which were more expensive to remedy than the plugging.

Beckett decided production could be maintained at a constant level if the wells were treated with a mild backflush that would merely keep

WORKERS at Yorba Linda field, where stimulator was developed, check downhole portion of the tool. Swab cups attached to tubing force fluid out perforations, keep them clear of sand and silt.

JOE K. BECKETT, production foreman for Western Gulf Oil Co. at Bakersfield, Calif., is a veteran Western Gulf employe. He has been affiliated with the company more than 25 years. His service with the Gulf organization includes 2 years spent in Kuwait with Kuwait Oil Co., Ltd.

sand and silt from plugging the formations and at the same time not seriously disturb the formation.

He points out, however, the stimulator is primarily for shallow wells with unconsolidated sands such as those found in Yorba Linda. The formation at Yorba Linda is the Reppetto sand found at about 2,500 ft.

The equipment. Surface equipment of the stimulator basically is a hydraulic lifting unit which raises the tubing string, pumping rods, and other downhole equipment.

Two hydraulic rams 8 in. in diameter provide the lifting power. The downstroke of the rams is absorbed by a dashpot for each ram. This prevents any tubing damage when the string is lowered into the hole.

At the wellhead, the casing hanger is equipped with seals which permit the tubing string to be raised and lowered without losing pressure. The casing hanger is mounted on conventional wellhead equipment.

The big difference in the downhole equipment is the swabs, which are attached to the tubing string just above the perforations.

How it works. The stimulator is equipped with an automatic timer which controls the frequency of the downstrokes. The number of downstrokes varies with the need. Some wells may require only one a day; others several within an hour. The actual 8-ft. downstroke takes only 4 seconds.

Based on the work at Yorba Linda, downstroke pressure under the swab cups is 100 psi. in 7-in. casing. The pressure will vary with the liquid level in the annulus, the gas-oil ratio of the fluid, and the backpressure held against the formation. All wells treated have been cased with 7-in., but some of the wells slated for treatment in Fruitvale will have casing ranging in size from 4¾ in. to 8⅝ in.

The small amount of pressure created under the swab cups shows the stimulator is not suitable for unplugging a well where the pressure differential across the plugged perforations exceeds the pressure created by the downswabbing. However, this small amount of pressure was sufficient to keep the perforations free of sand and silt plugging.

Fluid for the downswabbing comes from the well, and the amount of fluid used has varied. Normally, only enough fluid is needed to cover the swabs during the downstroke, but in one case there was a 500-ft. column of oil in the annulus. In this case, the swabs were set several hundred feet above the perforations due to the condition of the well rather than a few feet above the perforations, which is normal practice.

Crude at Yorba Linda is 13° to 16° gravity with a water cut ranging from 10 to 70%.

Limitations. The experimental stimulater built for use at Yorba Linda has certain limitations since it was primarily designed for this shallow field. However, Beckett is altering some parts of the unit and expects to use it successfully at Fruitvale, where the producing depth is about 4,500 ft. The hangers which carry the weight of the tubing when the rams are on the upstroke have a capacity of 100,000 lbs., which will be sufficient to handle the deeper Fruitvale wells.

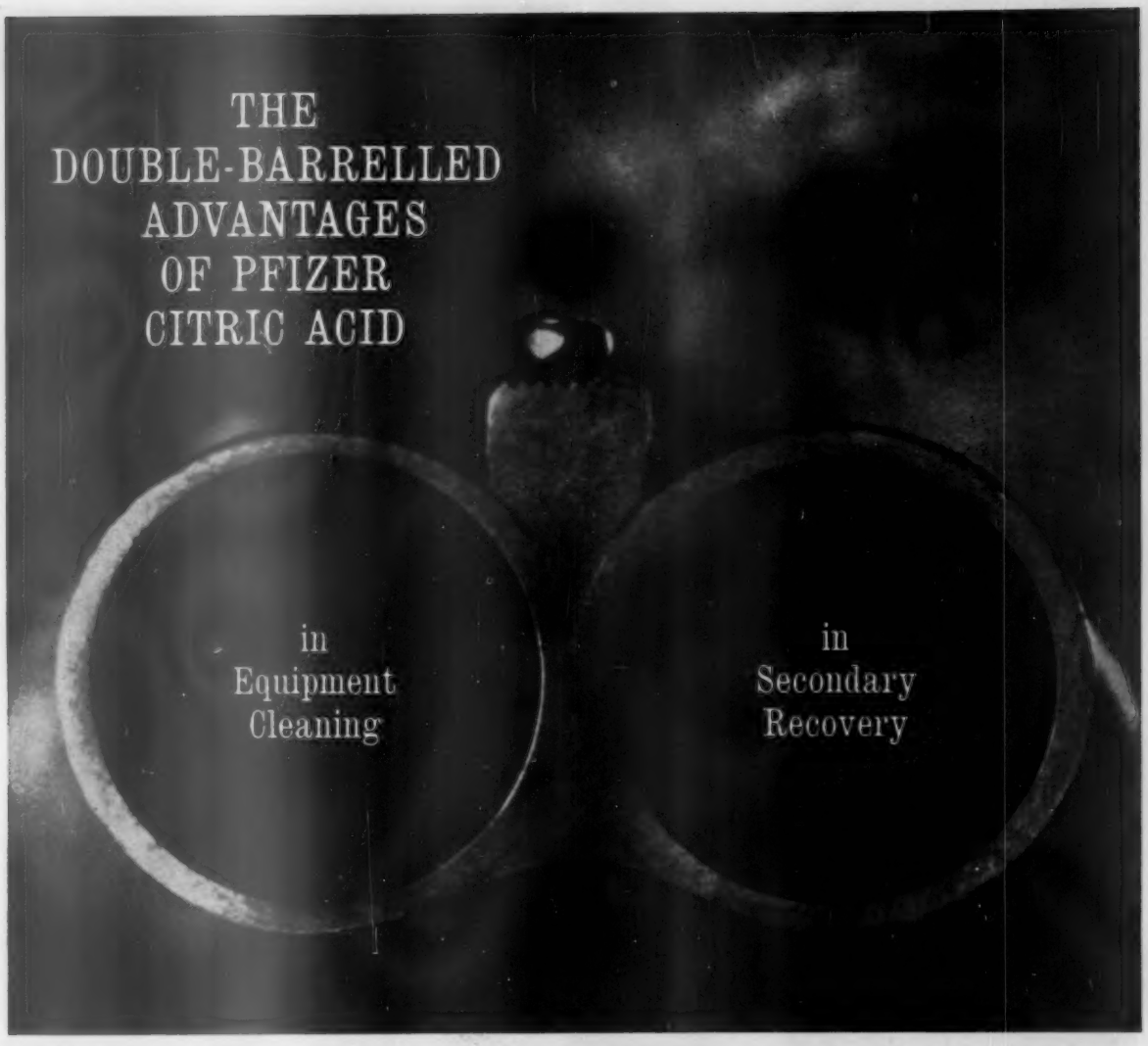
Beckett has come up with another idea for treating wells which might be too deep or require more downswabbing pressure than that provided by the stimulator. He calls this technique the "automatic backflush method."

This method involves a valve arrangement in the tubing string between a production packer and pump shoe. The packer serves to hold back clean oil which is pumped into the annulus. When pressure under the packer indicates plugging is starting, the valve in the tubing is opened, permitting the oil in the annulus to flow into the formation.

As long as the reservoir pressure is less than the hydrostatic head, the formation will take fluid without pumping.

The automatic backflush method has three advantages over the downswabbing; greater pressure can be obtained; a bigger volume of oil can be reversed through the perforations; and it is faster than a manual backflush since there is no need to recover the backflush oil stored in the annulus above the packer.

Since the work in Yorba Linda primarily was experimental, no concrete cost figures are available on just what might be saved by using Beckett's stimulator rather than conventional cleaning methods. However, the success achieved at Yorba Linda has led Western Gulf to apply for patents covering Beckett's ideas—and to give him the green light to try out his methods at Fruitvale.



●● Pfizer Citric Acid today is rapidly becoming a more useful product for the petroleum industry. Not only is it an excellent chemical cleaning agent for petroleum refining equipment, but its long established use in secondary oil recovery continues to grow.

In cleaning petroleum refining equipment, citric acid effectively dissolves scale and corrosion deposits. Citric acid also prevents the reprecipitation of dissolved scale. It will not cause chloride stress corrosion cracking. Consult your chemical cleaning service company regarding these and other advantages of cleaning equipment with Pfizer Citric Acid.

●● In secondary oil recovery, Pfizer Citric Acid prevents sandface plugging caused by iron in the injection water. The results:

- higher injection rates
- lower injection pressures
- less frequent downtime on filters
- less replacement of parts due to rusting
- reduced frequency of costly acidizing or fracturing operations

Pfizer Citric Acid sequesters iron more efficiently and economically than any other chemical. It is non-toxic, water soluble and easily handled.

Pfizer

Manufacturing Chemists for over 100 Years

Science for the world's well-being

CHAS. PFIZER & CO., INC., CHEMICAL SALES DIVISION

630 Flushing Ave., Brooklyn 6, N. Y.

Branch Offices: Clifton, N. J.; Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Tex.; Montreal, Can.

Write Pfizer for details on the use of citric acid in chemical cleaning or in water flooding applications.

I want to learn more about the use of Pfizer Citric Acid for chemical cleaning and in secondary oil recovery.

Please send me:

☐ Technical Bulletin 102: "Pfizer Products for Chemical Cleaning"

☐ Technical Bulletin 97: "Pfizer Products for Petroleum Production"

Name_____

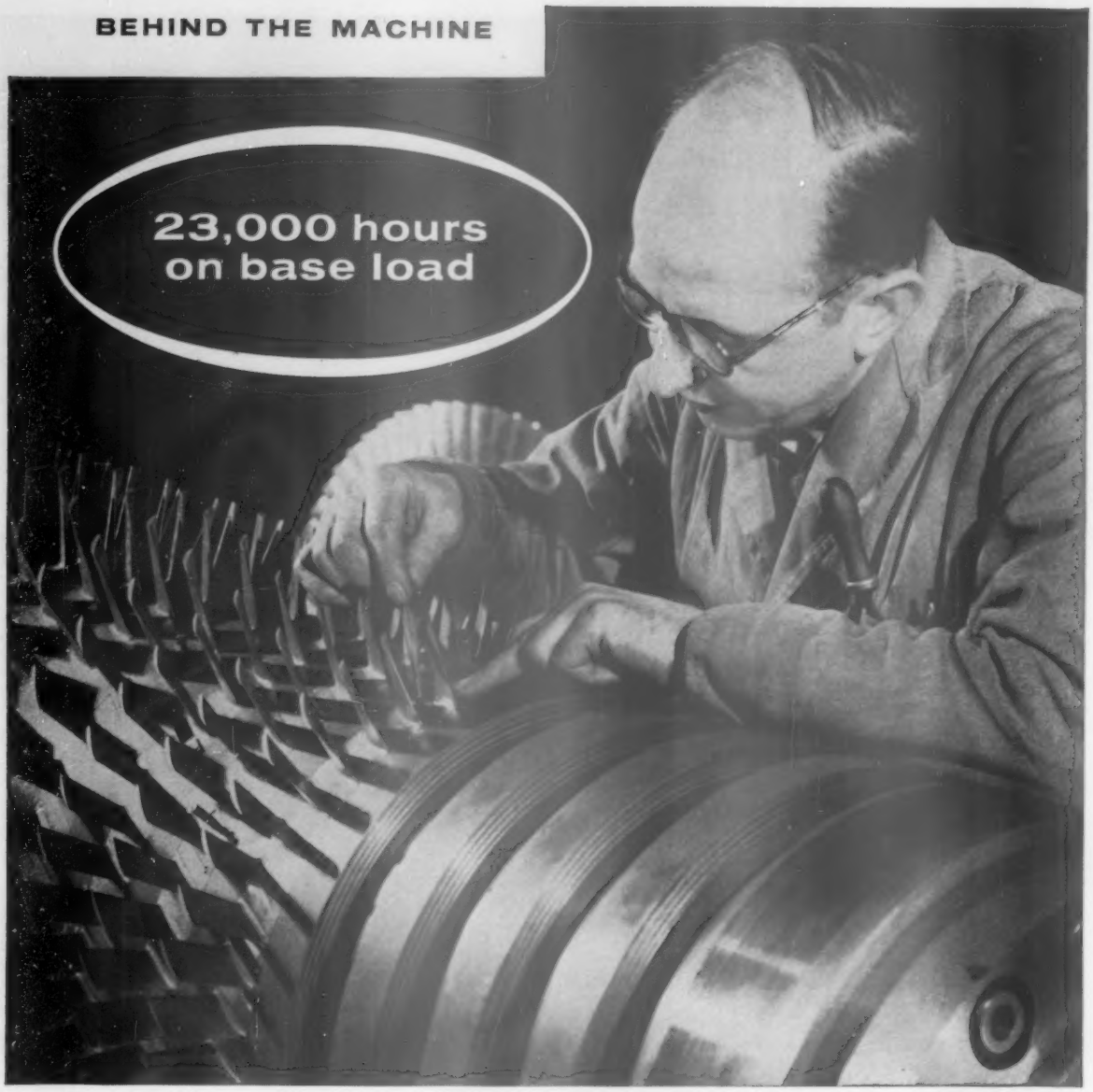
Company_____

Address_____

City_____ Zone___ State____

OG

BEHIND THE MACHINE



The proved reliability of AEI industrial gas turbines is typified by a machine in Venezuela which has recently completed 23,000 hours running on base load. AEI makes a range of industrial gas turbines with ratings from 1,750 kW upwards designed to run on gaseous or liquid fuels.

The picture shows work on the compressor rotor of L2IC gas turbines being built, at the AEI Turbine-Generator Division Factory for the Basrah Petroleum Co. These feature a single shaft design which ensures stable regulation and makes them particularly suitable for parallel operation with other generating equipment.

This is a product of AEI Turbine-Generator Division, Britain's largest manufacturer of Turbine-Generators.

AEI **Associated Electrical Industries Export Ltd**
33 GROSVENOR PLACE, LONDON SW1

B/L002

How much contamination is allowed in products pipelines?

BY W. L. NELSON
Technical Editor and Petroleum Consultant

What degree of contamination is allowed in the slugging of several materials through a products pipeline? Is it customary to allow a degradation of product? R. Wm. T.

Although major pipeline companies allow themselves a degradation in the quality or specifications of the product, such a degradation allowance is primarily a legal position rather than a practical necessity. In other words, the products seldom suffer any significant degradation. The inability to discover any contamination in the outgoing product is intimately related to the size of batch or tender required for entrance to the line.

If batches of 25,000 bbl. or larger are required, it is evident that the 30 bbl. or so of contaminant that is introduced by splitting the interface material at the center represents only 0.001 fraction of material and such an amount can scarcely be detected by the conventional routine test methods. Obviously there is little need of a degradation allowance when handling such large batches. If 2,000 and 5,000 bbl. batches are contemplated then contamination might possibly be detectable but even 0.005 or 0.01 fraction of contaminant could not be detected except by using great care during testing.

Note also that the test properties of the product may not be close to the specification limit. As an example, the specification limit on sulfur for aviation gasolines, is 0.05% sulfur. Processors of West Texas crude oils may find trouble with this specification but nearly all other crude oils such as those from the Mid-Continent, California, Venezuela, Mexico, and the Middle East will produce aviation gasolines which contain 0.04% sulfur or possibly only 0.02% sulfur.

Only when the percentage of sulfur in the crude oil is abnormally high will trouble with the 0.05% specification be encountered. Thus a contamination of 10% of a 0.04% aviation gasoline by another material which contains 0.10% sulfur could be permitted without exceeding the specification limit of 0.05% sulfur.

If the tests of the products are really close to (or at) the specification limit, then one must resort to a study of the accuracy limits of the common test methods. Accuracy limits of the test methods and commonly accepted allowable variations in properties are indicated in Table 1. With the allowable variations of Table 1 it is possible to compute the barrels of contaminant (or its percentage) permitted in the pipeline stream and also to compute the minimum size of batch that can be handled.

TABLE 1—ALLOWABLE CONTAMINATIONS IN PRODUCT PIPELINES

Test properties	Variation encountered in laboratory: Repeat checks	Variation encountered in laboratory: Between laboratories	Change allowed in pipeline samples
Flash point	1° F.	2° F.	0.05-1° F.
End point	6° F.	.....	2.75° F.
Octane No.	.....	*2 units	0.2 units
Conradson C.R.	†50-60%	†120-150%	§100%
	†11-35%	† 27- 87%	§20-80%
Pour point	5%	10° F.	2° F.
Sulfur	‡0.001-0.02	‡0.002-0.04	2.5-4%
	‡0.02 -0.08	‡0.05 -0.16	0.9-2.2%

*0.2 units using the direct-comparison method.
†On 10% bottoms.
‡Lowest values for low test values.
§Deviation from true value.

Corrosive propane

Tests with mercury indicate that elemental sulfur is sometimes present in our propane. What is the source of this sulfur and what should we do about it? L. T.

No one can know the exact source of the sulfur. Strong sulfuric acid oxidizes hydrogen sulfide to free sulfur. If the propane is doctor sweetened, too much sulfur may have been added during treatment. Another similar situation is a lack of enough mercaptans to satisfy the lead plumbite reaction. Occasionally refiners have had to add sour distillates to gasoline to permit completion of the plumbite reaction and in one instance in treating a rocket fuel, it was necessary to purchase a mercaptan in order to complete the reaction.

Doctor treating is the usual method of removing free sulfur but caustic washing is also used. The caustic should be used long enough to cause it to become an aqueous solution of sodium sulfide or sodium polysulfide which seems to be more effective than fresh solution.

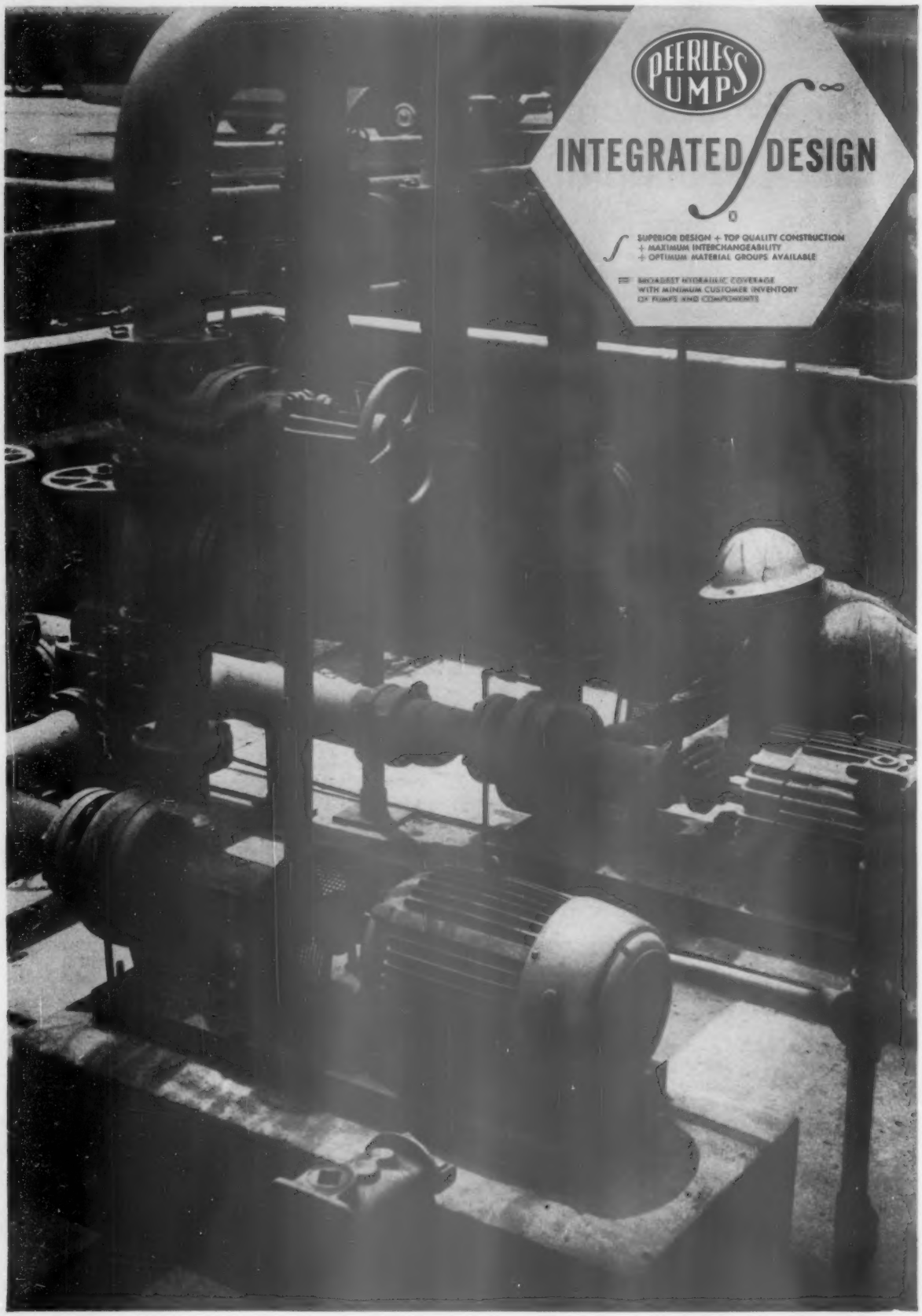
The doctor test used in reverse (i.e. adding mercaptans rather than sulfur) is a better test for elemental sulfur than the mercury test mentioned in the question. Even traces of sulfur (0.001 wt. %) are corrosive if traces of mercaptans are present but 10 times are much free sulfur is not corrosive (by the corrosion test) if mercaptans are completely absent.

Cost indexes of construction equipment

Where can we find the costs of construction equipment during recent years so that we can figure depreciation rates? G. T. M.

This department has no good source of the costs of construction equipment. However, the changes in price of a large number (40 or more) of items of roadbuilding, etc., equipment are carried each month in Wholesale Prices and Price Indexes of the U. S. Dept. of Labor. Codes 1120 through 1129 appear to be most applicable.

In Canada, the depreciation and rental rates of construction equipment are based on replacement value rather than on original costs that may be months or years out of date.


PEERLESS PUMPS
INTEGRATED DESIGN
SUPERIOR DESIGN + TOP QUALITY CONSTRUCTION
+ MAXIMUM INTERCHANGEABILITY
+ OPTIMUM MATERIAL GROUPS AVAILABLE
BROADEST HYDRAULIC COVERAGE
WITH MINIMUM CUSTOMER INVENTORY
OF PUMPS AND COMPONENTS

CAN CUT YOUR PUMP INVENTORY COSTS AS MUCH AS 85%

Maximum interchangeability means far fewer parts required to fill all your day-to-day needs.

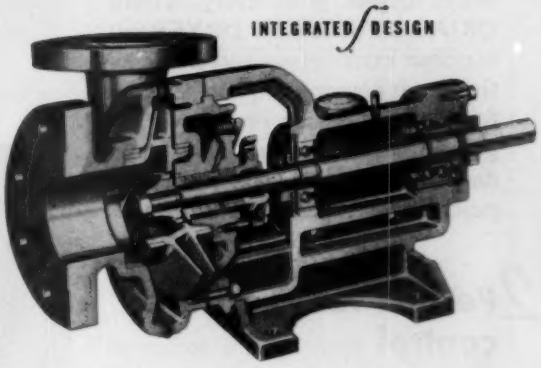
The effectiveness of integrated design of Peerless Type DL and DM process pumps can probably best be shown by a recent customer's order. This customer purchased 150 process pumps for his plant. Of the group, 120 have interchangeable parts. As a result, pump inventory of spare parts can now be cut to a fraction of former requirements freeing important dollars for many other uses. And with the greater interchangeability, the customer predicts even more savings because of speedier maintenance work and less time lost waiting for proper parts.

And, if interchangeability of Peerless Type DL and DM pumps captures your interest, please remember this fact. Because Type DL and DM pumps are of integrated design, you can order them out of stock just the way you need them. For example, there is a choice of semi-open or enclosed impellers; water or air cooled backplates; oil or grease lube bearing housing; packing or mechanical seals; and liquid ends of any machineable metal.

There is one more point to be told about these pumps. They are real performers. Proven time after time, they efficiently pump virtually all liquids used in the process industries.

INTEGRATED ∫ DESIGN FOR GREATER EFFICIENCY AND SAVINGS

PEERLESS PUMPS



VERSATILE IS THE WORD FOR THIS PEERLESS DL—DM PROCESS PUMP

The Peerless Type DL and Type DM process pumps will handle virtually all liquids used in the chemical, process and refining industries. Both models are single stage, single suction centrifugal types with a vertically split case, and both models have capacities to 1000 gpm, heads to 430 feet and working pressures to 300 psig. Type DL models have a temperature range of 250°F, while the Type DM models have a range of 450°F.

FOR EXAMPLE: WITHIN FIVE DIFFERENT SIZE PUMPS THESE 22 PARTS ARE INTERCHANGEABLE—

1. Shaft
2. Back plate
3. Packing rings
4. Radial bearing
5. Packing gland
6. Thrust bearing
7. Pump frame
8. Impeller lock nut
9. Bearing lock nut
10. Seal lantern packing
11. Key
12. Thrust plate
13. Water slinger & set screw
14. Lockwasher-bearing
15. Gasket-voluta case
16. Gasket-thrust plate
17. Oil retainer plate
18. Oiler: constant level
19. Lockwasher-impeller
20. Gland clamp
21. Splash plate
22. Retaining ring bearing

Putting Ideas to Work

fmc FOOD MACHINERY AND CHEMICAL

Peerless Pump HYDRODYNAMICS DIVISION

Offices:
New York; Detroit; Cleveland; Chicago; Indianapolis; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno.
Distributors in principal cities.
Consult your telephone directory.

Peerless Pump, Hydrodynamics Division, Food Machinery & Chem. Corp.
301 West Avenue 26, Los Angeles 31, California
Send me Bulletin B-1608 ☐ Have field engineer contact me ☐
Company_____
Name_____
Address_____
City_____ State_____

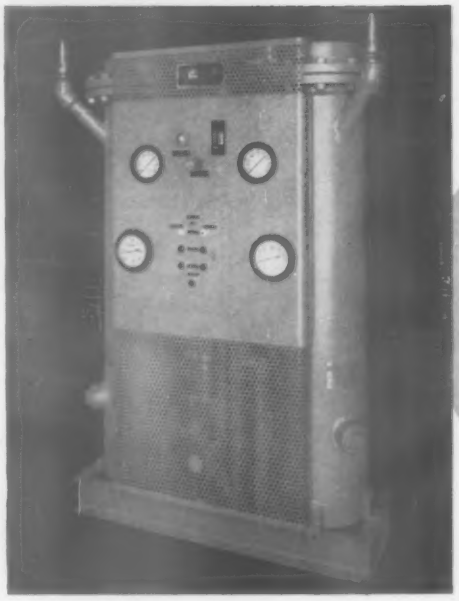
KEMP ORIAD DESICCANT DRYERS

stop moisture best, cost less 3 ways!

1 Complete reactivation An exclusive 3-zone embedded-heater design gives every KEMP ORIAD DESICCANT DRYER unmatched extra-drying power. Reactivation is always complete and uniform in *any* drying process of air, gases or liquids, assuring maximum desiccant capacity—minimum dew-point performance.

2 Perfect temperature control Heat input is conserved by thermostatic control . . . ideal temperatures are maintained for the highest operating efficiency at the lowest operating costs. An alarm system guards the entire network.

3 Full automatic operation A simple setting of the program timer, and everything is automatically regulated. Drying results with the least pressure loss, lowest operation and maintenance cost. For further details, write for Bulletin D-103 . . . or call your local Kemp Man listed in the Chemical Engineering Catalog.



It always pays to come to

KEMP OF BALTIMORE

THE C. M. KEMP MANUFACTURING CO.
405 E. Oliver Street • Baltimore 2, Maryland

The
FOREMAN'S PAGE

Here is a description of . . .

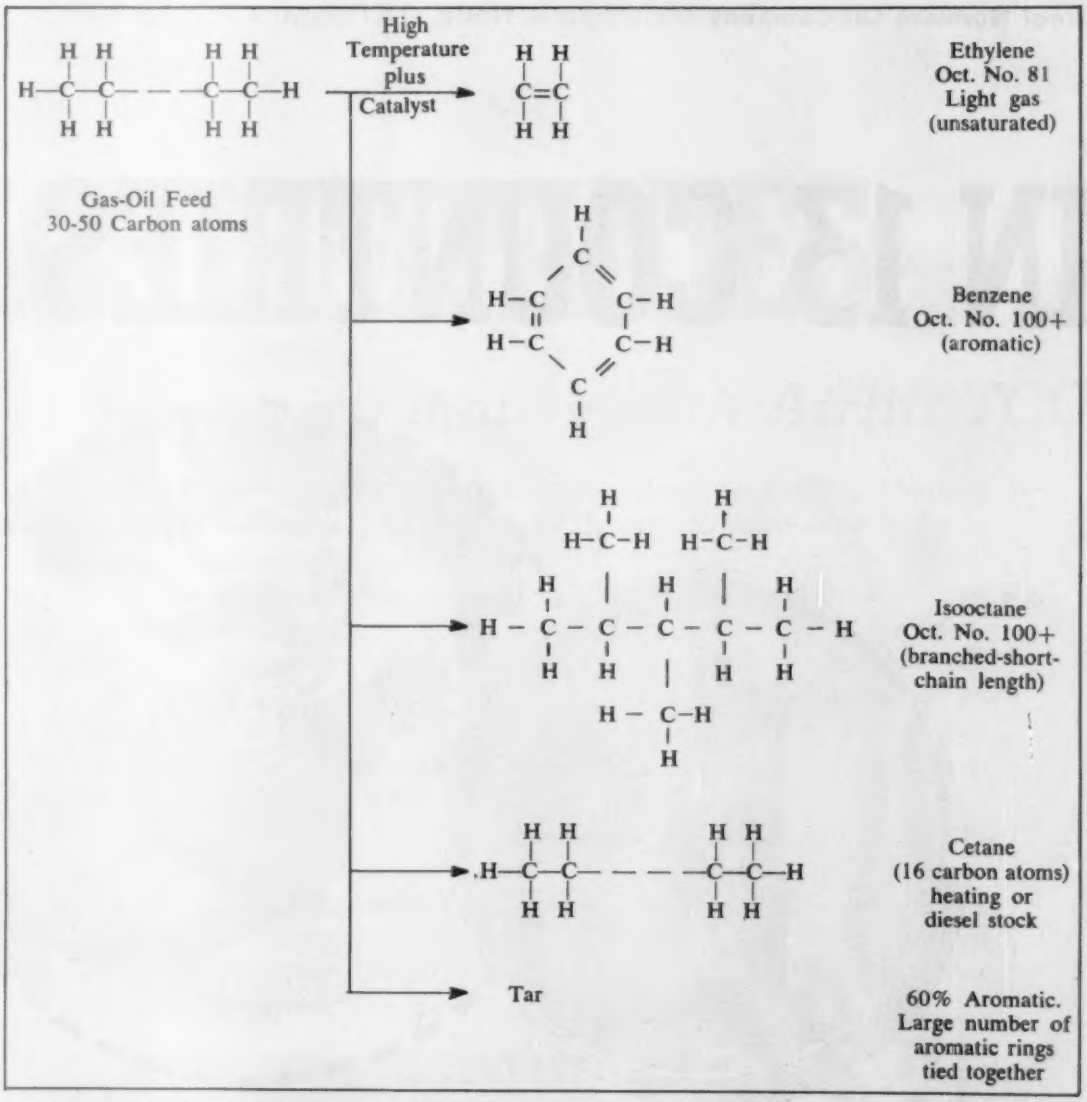
What happens in catalytic cracking

NORMAL feed (gas oil) to a catalytic cracker contains hydrocarbons having from 30 to 50 carbon atoms. Fig. 4 shows what might happen to a very high-boiling compound, by cracking it at high temperature using a catalyst. The products shown are just typical examples. In an actual cracking operation, thousands of different compounds would be produced. Some of them would be in the gasoline cut, others in the heating oil, and so forth.

It was mentioned that a catalyst is used in this type of cracking operation. What is a catalyst? It is a substance which **promotes** a reaction, but does not react in any way itself.

Note in catalytic cracking we have produced, by chemical reaction, short chain length, unsaturated, and aromatic hydrocarbon compounds—all excellent components for gasoline.

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Oil Co.



CATALYTIC CRACKING differs from thermal cracking in that a catalyst is used and the feed stock is generally much heavier. Fig. 1.

Agip Mineraria, S.p.A. Italy • **Antar Pétroles de l'Atlantique** France •

"Aquila" Italy • **Bay Refining Company** Michigan • **Century Refining Company**

Kansas • **Chinese Petroleum Corporation** Formosa • **"Condor"** Italy •

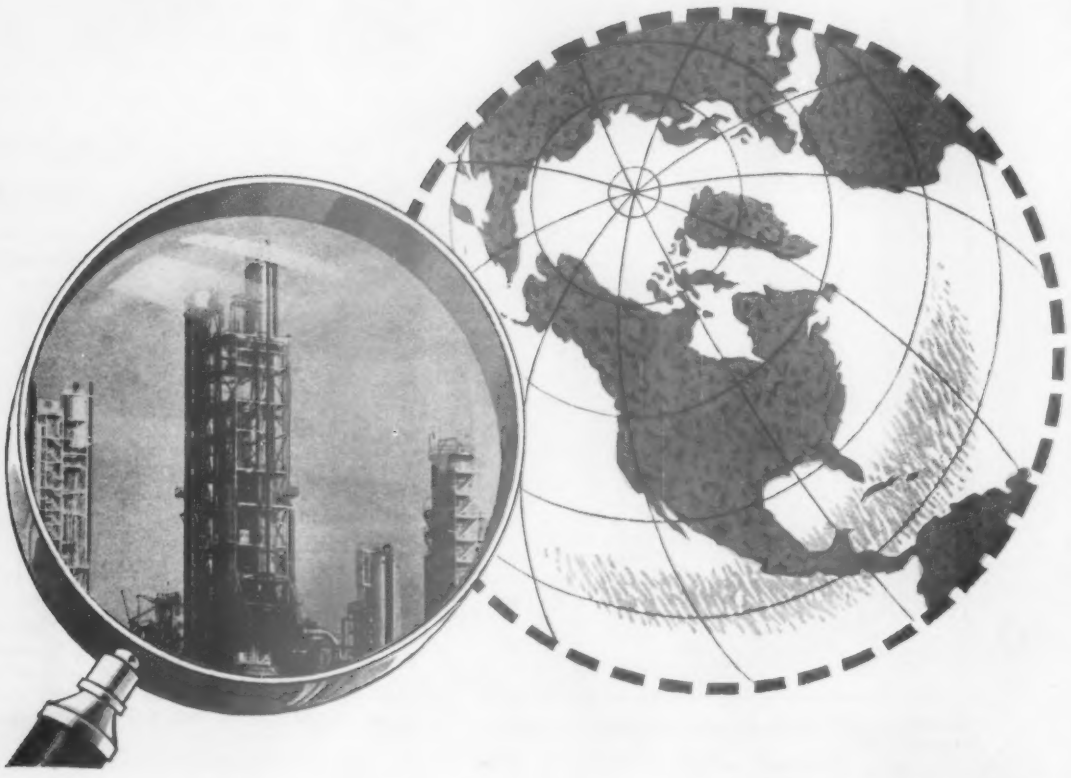
Continental Oil Company Louisiana/New Mexico • **Delhi-Taylor Oil Corporation** Texas •

Delta Refining Company Tennessee • **Derby Refining Company** Kansas •

Deutsche Erdol, A.G. Germany • **Gelsenberg Benzin, A.G.** Germany •

Great Northern Oil Company Minnesota • **Neste, OY** Finland •

IN 13 COUNTRIES...



"Petrofina," S.A. Texas/Italy • **Petróleos Mexicanos** Mexico • **Phillips Petroleum Company** Oklahoma/Utah • **Pontiac Eastern Corporation** Mississippi • **Ruhrchemie, A.G.** Germany • **Sacor** Portugal • **Shamrock Oil and Gas Corporation** Texas • **Signal Oil and Gas Company** California • **Société Chérifienne des Pétroles** Morocco • **Standard Oil Company (Ohio)** Ohio • **Standard-Vacuum Oil Company** Australia/Philippines • **Turkiye Petrolleri Anonim Ortakligi** Turkey • **"União"** Brazil • **Vickers Petroleum Company** Kansas

30 COMPANIES

are saving money with Airlift TCC

Construction costs on Socony Mobil's Airlift Thermofor Catalytic Cracking units have been cut almost in half during the past ten years—a result of continuing Mobil research.

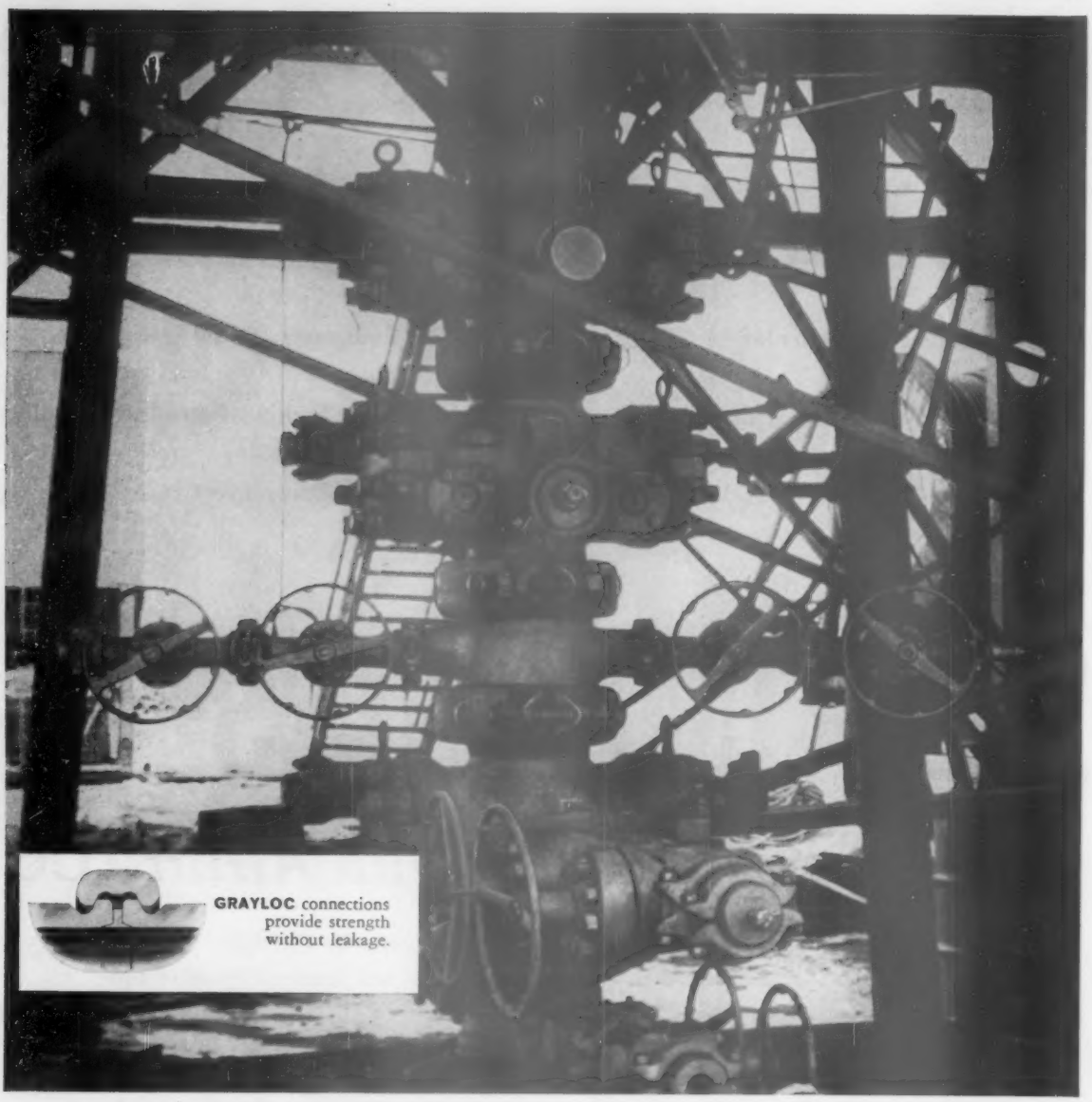
Operating costs have also been reduced. Three years ago Mobil introduced the Durabead catalyst, opening new money-saving horizons in TCC operation. Today's improved Heavy Durabead catalyst brings still greater economies.

Around the world, 51 Airlift TCC units are turning oil into money for 30 companies. Thirty-five of these units are operated under license from Socony Mobil by the 29 companies listed above. Two more units are now under construction, in Mexico and the Philippines. Mobil, itself, brings the company total to 30. Mobil has installed 16 Airlift TCC's in its own refineries in the United States and Europe.

For any refiner interested in the TCC, Mobil will help work out the best processing procedures and cracking yield patterns for a given crude. Address inquiries to Process Promotion Department, Socony Mobil Oil Company, Inc., 150 East 42nd Street, New York 17, N. Y.

SOCONY MOBIL OIL COMPANY, INC.

Leader in Refining Research



GRAYLOC on Well Head and Control Equipment Safely Withstood 7,300 PSI

This all Grayloc assembly, in use on a well in Eastern Venezuela, withstood well pressures of 7,300 psi during drilling operations — proving that Grayloc equipped assemblies provide the greatest possible blow-out protection. The assembly required no additional tightening after the original make-up.

It took a native crew less than six hours to nipple-up this Grayloc equipped well head and control assembly, and it required approximately 24 inches less substructure height than a comparable flanged hook-up.

Learn how Grayloc connections can save you extra hours and money on control systems with complete blow-out protection.

Write for the new Gray Catalog *today.*

GRAY *Tool Company*

6002 P. O. Box 2291 Houston 1, Texas Riverside 7-1240

Design of sucker-rod strings (conclusion)

BY JOSEPH ZABA

Tapered String Design—Second Method

AS PREVIOUSLY stated, under the second method of designing the tapered rod strings, the stresses are equal in the top rod of each section of the string. Considering a two-way tapered string, the stress S_1 in the top rod of the lower portion of the string for fluid with specific gravity 1.0 equals:

$$S_1 = \frac{.34d^2\,RC}{A_1} + \frac{R_1\,R\,W_1\,C}{100\,A_1} \quad (1)$$

Where:

d = diameter of plunger, in.

$.34d^2$ = weight of water per foot for plunger with diameter d, lb.

R = total length of string, ft.

C = acceleration factor.

A_1 = cross-sectional area of rods in the lower section, sq. in.

R_1 = per cent of rods of lower section in total string.

W_1 = weight of rods in lower section, lb./ft.

Stress S_2 in the top rod of the upper section of the string equals:

$$S_2 = \frac{.34d^2\,RC}{A_2} + \frac{R_1\,R\,W_1\,C}{100\,A_2} + \frac{R_2\,R\,W_2\,C}{100\,A_2} \quad (2)$$

Where:

A_2 = cross-sectional area of rods in the upper section, sq. in.

R_2 = per cent of rods of upper section in total string.

W_2 = weight of rods in the upper section, lb./ft.

Other symbols are as in Equation 1.

The two stresses are to be equal. Therefore:

$$\frac{.34d^2\,RC}{A_1} + \frac{R_1\,R\,W_1\,C}{100\,A_1} = \frac{.34d^2\,RC}{A_2} + \frac{R_1\,R\,W_1\,C}{100\,A_2} + \frac{R_2\,R\,W_2\,C}{100\,A_2} \quad (3)$$

or

$$\frac{.34d^2}{A_1} + \frac{R_1\,W_1}{100\,A_1} = \frac{.34d^2}{A_2} + \frac{R_1\,W_1}{100\,A_2} + \frac{R_2\,W_2}{100\,A_2} \quad (4)$$

also

$$R_1 + R_2 = 100 \quad (5)$$

Substituting $R_2 = 100\text{-}R_1$ from Equation 5 into Equation 4 and solving for R_1:

$$R_1 = \frac{100\,W_2\,A_1 + .34d^2\,(A_1 - A_2)}{W_1\,A_2 + W_2\,A_1 - W_1\,A_1} \quad (6)$$

If the string consists of a three-step taper, three equations have to be solved. By substituting the weights of different rod sizes, simple equations may be obtained for different combinations of rods in relation to plunger size. Since there are slight variations in the data on weight of rods of different makes there are slight variations in constants of equations offered by different investigators. One set of such equations is as follows:[1]

For ⅝ and ¾-in. rod combinations	$R_1 = 76.67 - 7.08d^2$
For ¾ and ⅞-in. rod combinations	$R_1 = 79.44 - 4.32d^2$
For ⅞ and 1-in. rod combinations	$R_1 = 80.70 - 2.92d^2$
For ¾, ⅞, and 1-in. rod combinations	$R_1 = 67.24 - 6.96d^2$
	$R_2 = 15.60 + 3.82d^2$

In each case the remaining portion of the string can be found by difference. The total must equal 100%.

By substituting actual plunger size in these equations, the data in Table 8 may be found.

Tapered string design—example. To compare the results obtained by the use of the two methods let's assume the following conditions: Pumping depth 7,000 ft., fluid at the pump, fluid gradient 0.433 (water), corrosion inhibited with 100% efficiency, 1½-in. pump, tapered string of ¾, ⅞ and 1-in. rods with 33,000-psi, working stress rods. Combination of stroke and speed of pumping is such that the acceleration factor equals 1.2.

Under the **first method** of design the steps of calculations would be as follows:

1. For fluid gradient of 0.433 and 1½-in. plunger the weight of fluid is 0.760 lb./ft. (Table 7, Part 19). The accelerated weight of fluid is 0.760 × 1.2 = 0.91 lb./ft. For the given depth the total accelerated weight of fluid is 7,000 × 0.91 = 6,400 lb. approximately.

2. Three-fourths-inch rods with working stress of 33,000 psi. can handle approximately 14,600 lb. (Fig. 25, Part 19). The difference between this weight and fluid weight (14,600-6,400 = 8,200 lb.) is the weight of ¾-in.

TABLE 8—SUCKER-ROD COMBINATION TO GIVE EQUAL STRESS IN TOP ROD OF EACH ROD SIZE

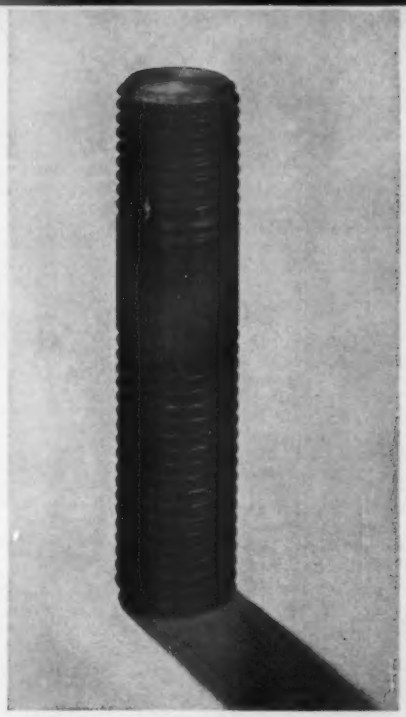
Plunger diam. (in.)	⅝ and ¾ in. Per cent ⅝ in.	⅝, ¾ and ⅞ in. Per cent ⅝ in.	⅝, ¾ and ⅞ in. Per cent ¾ in.	¾ and ⅞ in. Per cent ¾ in.	¾, ⅞ and 1 in. Per cent ¾ in.	¾, ⅞ and 1 in. Per cent ⅞ in.	⅞ and 1 in. Per cent ⅞ in.
¾	72.70	57.89	22.79	76.99	63.33	17.74	79.14
13/16	70.45	54.41	24.71	75.62	61.12	18.96	78.13
1	69.60	53.10	25.36	75.12	60.28	19.42	77.77
1 1/16	68.68	51.79	26.14	74.55	59.37	19.92	77.39
1¼	68.44	46.95	28.70	72.69	56.38	21.56	76.13
1⅜	60.75	39.44	32.76	69.71	51.59	24.20	74.12
1¾	55.03	30.62	37.50	66.20	45.94	27.28	71.76
2	48.37	20.34	43.10	62.35	39.40	30.88	69.01
2¼	40.90	8.77	49.36	57.57	32.04	35.45	65.91
2 7/16	34.73	....	....	53.77	25.89	38.25	63.36
2½	32.53	....	....	52.43	23.74	39.45	62.44
2¾	23.13	....	....	46.97	14.64	44.45	58.59
3¾	....	....	....	18.82	....	....	39.64

Gardner-Denver Mud Pump parts are easily replaced at the rig site. J&L Supply stores in the United States and Canada stock the parts. This is how to.....

Simplify

This GXN is one of two Gardner-Denver mud pumps in tandem arrangement on a wildcat in Louisiana. Gardner-Denver engineers designed these pumps for complete service in the field. And Gardner-Denver mud pump parts are as near as your J&L Supply store. Unitized, trailer-mounted, offshore—any rig with Gardner-Denver mud pumps is never handicapped for lack of experienced Gardner-Denver service or genuine Gardner-Denver parts.

Mud Pump Maintenance



SAFEGUARD AGAINST RIG BREAKDOWN.

There is a difference in valve cap studs. Gardner-Denver studs are machined from alloy steel and heat treated.

To avoid costly failures, damaged equipment, insist on genuine Gardner-Denver parts. Protect your investment in quality.

Ask your J&L Supply man for literature on Gardner-Denver mud pumps in sizes to 1250 h.p. for drilling to any depths.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....It's the best available

rods which these rods can handle.

3. The weight per foot of ¾-in. rods is 1.63 lb./ft. (Table 5, Part 19). The accelerated weight of rods is 1.63 × 1.2 = 1.956 lb./ft. Therefore, 8200/1.956 = 4,200 ft. is, in round figures, the permissable length of the ¾-in. rod portion of the string.

4. Sexen-eighths-inch rods with 33,000-psi. working stress can handle approximately the load of 19,800 lb. Therefore, 19,800 − (6,400 + 8,200) = 5,200 lb. is approximately the weight of ⅞-in. rods which these rods can handle.

5. The weight of ⅞-in. rods is 2.2 lb./ft. The accelerated weight of rods is 2.2 × 1.2 = 2.64 lb./ft. Therefore, 5,200/2.64 = 2,000 ft. represents, in round figures, the permissible length of the ⅞-in. rod portion of the string.

6. One-inch rods would be used for the remaining 800 ft. of the string. Let's check whether or not the rods will be overstressed. The weight of 1-in. rods is 2.88 lb./ft., the accelerated weight is 3.46 lb./ft. The accelerated weight of 800 ft. of rods is 800 × 3.46 = 2,800 lb. in round figures. The accelerated load at the top 1-in. rod will be 6,400 + 8,200 + 5,200 + 2,800 = 22,600 lb. The cross-sectional area of 1-in. rod is 0.785 sq. in. (Table 5, Part 19). Therefore, the stress in the top 1-in. rod will be 22,600/0.785 = 28,800 psi. in round figures. This is below the permissible working stress of the selected 1-in. rods.

Under the **second method** the respective lengths of the different sections of the string are calculated directly from percentages in Table 8. These lengths are given below in comparison with lengths of rods calculated by the first method. The respective lengths of the two strings.

	Method 1	Method 2
¾-in. rods	4,200 ft.	3,600 ft.
⅞-in. rods	2,000 ft.	1,700 ft.
1-in. rods	800 ft.	1,700 ft.
Dead weight of the rod string in air	13,400 lbs.	14,500 lbs.

A check should be made on the stresses involved. The stresses in the top rod of ¾-in. and ⅞-in. sections are around 33,000 psi. and 30,000 under the first and second method, respectively. The top rods of the 1-in. sections are stressed to about 29,000 psi. by the first method, and around 30,000 psi. by the second.

Hollow Sucker Rods. These have been used for many years in different applications, for conventional pumping of shallow wells, for pumping of fluids with high sand content, since the high velocity of fluid helps to bring the sand to the surface, and for introduction of hot oil or paraffin solvent into the tubing below the paraffin zone. Recently, with the increasing number of slim-hole completions, the use of hollow sucker rods has increased.

Calculations involving hollow sucker rods must take into consideration certain special factors, not present in operation of conventional rods. It will be more convenient to discuss the subject later with equipment for slim-hole pumping.

Bibliography

1. Alex Quayle: "Tapered Sucker Rod Strings," World Oil, November, 1950.

BOOKS

ESSENTIALS OF EARTH HISTORY. By William Lee Stokes. Published by Prentice-Hall, Inc., Englewood Cliffs, N. J. 502 pp. $8.75.

This is an outstanding presentation of the aspects of historical geology in our ever-changing world. The book has nearly 400 excellent and interesting illustrations which help the reader in understanding materials found on the earth's surface that provide clues to the past. Both physical and biological changes are apparent.

The basic facts of past history, major events that have occurred on the earth, and the relationships of one to the other are clearly discussed by the author. There is no mathematical treatment of the interesting subject material, nor is it necessary to be an advanced student of geology to derive benefit and enjoyment from this volume. The treatment is pitched toward liberal arts and cultural interests and is readily understood because the approach is a fundamental one. The explanations are supplemented with common-sense, everyday examples.

The historical treatment presented by the writer is a composite science; the findings of astronomy, chemistry, biology, and geology are skillfully combined. The reader will appreciate the flowing unity as it relates to the fundamental problems. He will find reading this both enjoyable and stimulating.

MANUAL OF PHOTOGRAPHIC INTERPRETATION. Published by The American Society of Photogrammetry, 1515 Massachusetts Avenue N. W., Washington 25, D. C., 868 pp.

This excellent and comprehensive work, which required two years to complete, is a fine presentation on the techniques and uses of photographic interpretations. This volume will appeal to both tyros and experts alike.

Many authors have contributed their professional skills to this book—which in effect is a symposium of extensive compilation covering all of the applied techniques. Separate chapters deal with the following fields: geology, soils, engineering, forestry, wildlife management, range management, agriculture, urban life analysis, archeology, geography, special forms of photo interpretation, and education and training in photo interpretation. The first 3 of the 16 chapters discuss the development (history) and fundamentals of photo interpretation, and the procurement of aerial photography.

The illustrations are numerous and outstanding. Examples include early kite and balloon photos taken during the Civil War, a fine set of combat photos during World War II, as well as recent illustrations taken from high-speed present-day aircraft. There are some color photos and the use of color is explicitly reviewed.

Numerous and complete bibliographies are provided at the end of each chapter. For example, in the chapter on geology, there are nearly 1,300 references covering a dozen special geological fields which are divided into their respective categories.

All in all, this is a monumental accomplishment. The fine glossary in the back of the book on terms pertaining to aerial photograph and interpretation lends a fitting professional final touch which is prevalent throughout the book.

INTRODUCTION TO GEOPHYSICAL PROSPECTING. By Milton B. Dobrin. Published by McGraw-Hill Book Co., 330 West Forty-second Street, N. Y. 36. 446 pp. $9.50.

This second edition is completely revised and will bring the reader up-to-date on technical advancements in geophysics which have occurred in the past 10 years. Covering all the geophysical methods, the approach defines and details exploration techniques used in the petroleum and mining fields.

An excellent table appears early in the text which compares the respective methods. It tells where, why, how, size of crews, objectives sought, approximate cost ranges, and the comparative use of each method in the world.

Illustrations and sketches abound throughout the book. Mathematical approaches and computations are spelled out. The reader is carried systematically through the respective problems and calculations, yet not too rapidly. Clarity is stressed.

Methods discussed include both reflection and refraction seismic, gravity, air and ground magnetics, electrical, and radioactivity. Special attention is paid to geological interpretations by the use of geophysics. A chapter is presented on case histories and geophysical integration. All in all, this is an excellent text for practical applications of geophysical principles.

SEVENTH ANNUAL INSTITUTE ON MINERAL LAW. Edited by Carlos E. Lazarus. Published by Louisiana State Press, Baton Rouge 3. 175 pp. $7.50.

This book centers especially on mineral law enacted in 1958-59, as it affected the State of Louisiana.

Papers are presented on major conservation developments, mineral rights and trust device, lease negotiations from the viewpoint of the lessee and from the viewpoint of the lessor, recent developments in oil and gas taxation, oil and gas conservation in prospect and in retrospect, review of 2 years' decisions in mineral law in Louisiana and federal cases, and the evolution of the further-development requirement under mineral leases.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

PETROLEUM
NEWS
from
Allied
Chemical
• technology advances aid drilling
• new alkylation catalysts with BF
• profit boosters for refining and gas treating
• corrosion protection for pipelines

Use of Solvay Calcium Chloride in oil well drilling is expanding rapidly as a result of many important new applications developed by technology. For example, it has been found that the addition of 1 per cent, or less, of Solvay Calcium Chloride in drilling mud filtrate almost completely eliminates clay hydration and is a big factor in the prevention of formation damage.

Among current uses are: as a workover fluid, a completion fluid, a carrier for gravel in gravel packing, an accelerator in cement, an additive in acidizing a solution to inhibit solubility of calcium sulfate, and as a bit lubricant (in combination with potassium stearate in soft water areas). For more information on uses, and for physical property data, write for Solvay's new booklet, "Calcium Chloride in Oil Well Drilling Applications."

- *Drilling technology discovers many new advantages in calcium chloride use*

■ **SOLVAY PROCESS DIVISION**

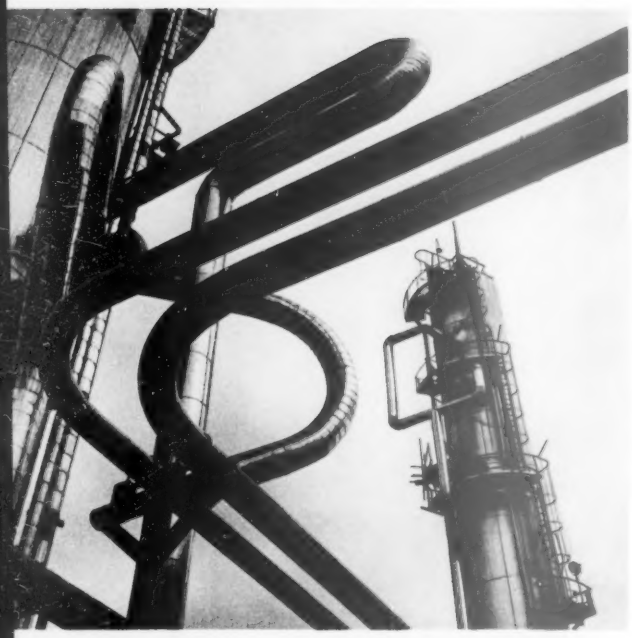
- *Costs cut, problems avoided with new alkylation catalysts made with Allied Chemical Boron Trifluoride*

Excellent results have recently been obtained by the use of General Chemical Division BF_3 in solid catalysts for the alkylation of isobutane with ethylene to produce diisopropyl...and substantial savings can be anticipated in other similar applications. These new alkylation catalysts bypass several problems encountered with many known catalysts. For instance, they can be used at low temperatures—avoiding undesirable side reactions and mixing problems due to changes in viscosity.

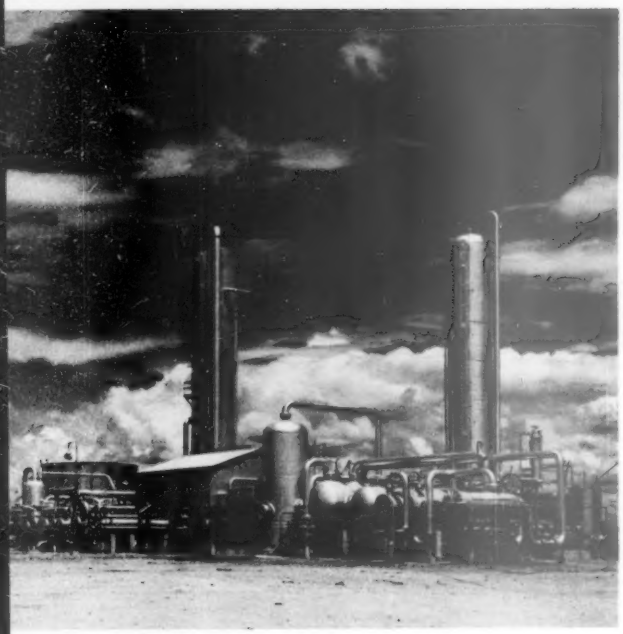
America's primary producer of two widely-used, basic alkylation catalysts—hydrofluoric acid and sulfuric acid—General Chemical has also long been a leader in BF_3 research and production. Perhaps BF_3 holds the answer to your organic synthesis problem. Ask for technical data on properties and uses.

■ **GENERAL CHEMICAL DIVISION**

• *Ammonia, ethanolamines and glycols from Allied Chemical conserve equipment, boost profits in petroleum and gas treating industries*



In many American refineries, ammonia from Nitrogen Division, the nation's largest producer, is protecting equipment from corrosion—holding down replacement costs. Used to neutralize the acid constituents of oil, it is one of the lowest cost neutralizing agents available to refiners.



In the gas treating industry, millions of dollars of additional revenue are now produced from wet and sour gases once flared as a nuisance—thanks to Nitrogen Division glycols and ethanolamines. These versatile chemicals remove impurities and excess moisture from natural, flue and process gas streams, in "scrubbing towers," preventing hydrate formation, both in gas treating plants and in long distance gas transmission lines. They are immediately available in quantity from locations in principal producing areas. Prices, shipping data and technical assistance available on request. ■ **NITROGEN DIVISION**

- *Thousands of miles of oil and gas pipelines protected from corrosion by Allied Chemical pipe coating materials*

For ease and speed of installation, efficient service and all-around economy, you can't beat thin-walled steel pipe in pipeline applications. Yet, this pipe would speedily succumb to the corroding effects of soil, moisture and electric currents, were it not for its shield of pipeline primer coating and wrapper.

A leader in the field for over half a century, Allied Chemical has accumulated a great store of "grass roots" experience on pipeline protection, a precise knowledge of the best systems to use under specific conditions, and a line of cleaners, thinners, fluxes and pipe wraps scientifically developed to give long, trouble-free service. Write for the 64-page "Field Manual of Natural Gas, Oil and Gas Pipelines" or contact our technical service experts about your particular problem. ■ **PLASTICS DIVISION**

• *basic to America's progress*

Allied Chemical

For more information, write
Allied Chemical Corporation, Dept. PA-OG
61 Broadway, New York 6, New York.

Allied Chemical Canada, Ltd.,
1450 City Councillors Street, Montreal

• ***principal products for the petroleum industry***

BARRETT DIVISION — BARRETT building materials.

GENERAL CHEMICAL DIVISION—Aluminum sulfate; BAKER & ADAMSON fine chemicals — Boron trifluoride, Fluosulfonic acid, Metallic nitrates, Potassium chromium sulfate; Disodium phosphate; Hydrofluoric acid; Muriatic acid; Oleum; Phosphates; Sodium metasilicate; Sodium Silicate; Sodium Sulfate; Sodium tripolyphosphate; SULFAN stabilized sulfuric anhydride; Sulfuric acid; Tetrasodium pyrophosphate; Trisodium phosphate.

INTERNATIONAL DIVISION — Selling Allied Chemical products for export markets.

NATIONAL ANILINE DIVISION—Adipic acid; Dodecenyl succinic anhydride; Fumaric acid; Maleic anhydride; NACCOLENE oil-soluble detergent; NACCONOL detergents; NACCOSOL wetting agents; NADONE cyclohexanone; NATIONAL dyes and pigments; NAXOL cyclohexanol; Organic chemicals and solvents; Phthalic anhydride; Succinic acid and anhydride.

NITROGEN DIVISION — Ammonia liquor; Anhydrous ammonia; Ethylene glycol; Ethanolamines and Ethylene oxide.

PLASTICS DIVISION — A-C polyethylene wax additive to lubricants and asphaltum; Coal-tar saturated pipeline felt and fabrics; Phenol; Pipeline enamels; Protective paints and coatings; Tank bottom compounds; Tar acids.

SEMET-SOLVAY DIVISION — Engineering services; Pipes and valves.

SOLVAY PROCESS DIVISION — Aluminum chloride; Ammonium chloride; Calcium chloride; Caustic potash; Caustic soda; Chlorine; Hydrogen peroxide; MUTUAL chromium chemicals — Sodium bichromate, Sodium chromate; NITROX cleansing, neutralizing rust inhibitor; Ortho-dichlorobenzene; OZENE solvent; Potassium carbonate; Soda ash; Sodium nitrite.

Items above appearing in light face capital letters are Allied Chemical trademarks. Printed in U.S.A.

PART 3
CONCLUSION

Gas hydrates: a practical control method

BY L. E. CONNEALY
Division Measurement Engineer
Texas Eastern Transmission Corp.

BEFORE the 1959-1960 winter very little methanol injection was done on laterals until evidence of freezing was found. Experience that winter indicates that careful planning pays off. Conditions that exist in a lateral after a hydrate has been permitted to form, prove the fallacy of permitting a hydrate to form. After a hydrate block is cleared, the line purged, and alcohol injection begun, most of the lateral will still be in such a state that further hydrates can form. This condition will remain until an equilibrium has been reached between the antifreeze used and fluid existing in the line.

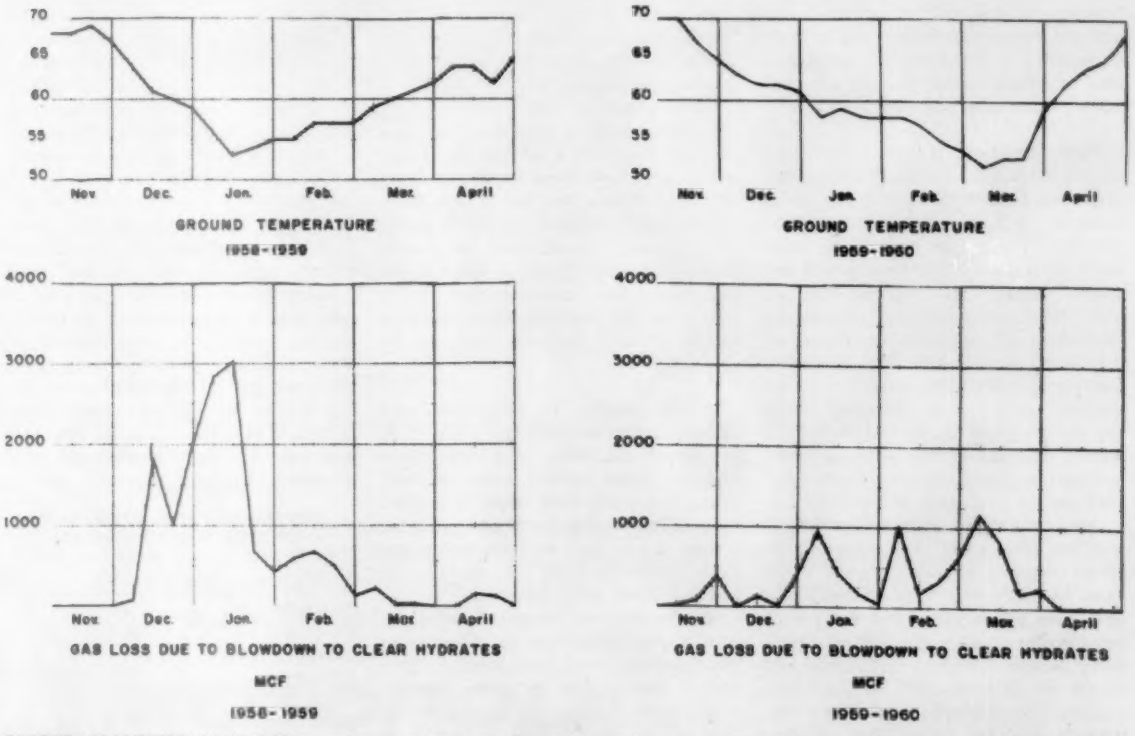
After an injection rate for a sufficient quantity of antifreeze has been set, it is important to maintain this rate as long as temperatures remain the same. When ground temperatures, or the criterion temperature, becomes lower, a sufficient increase in alcohol injection is required to allow for the temperature decrease. On days when ambient temperatures become fairly high there is a tendency to adjust pump rates lower. This is false reasoning if a criterion of ground temperature or the flowing gas temperature in the line is followed.

(This is Part 3 of a three-part report on gas-hydrate problems and how Texas Eastern Transmission Corp. handles them. Part 1 (O&GJ, Oct. 3, p. 116) discussed the origin of such problems and Part 2 (O&GJ, Oct. 17, p. 130) told how and why Texas Eastern uses methanol. This part describes steps associated with the injection of methanol.)

Rate variables. The injection rate for each 1 M.M.c.f. of gas going into the system is so variable that it can't be stated exactly. Some wells flow wet gas winter after winter and offer no freezing problems except under extremely cold conditions. Some wells can be kept flowing by addition of from 2 to 5 gal. of methanol per 1 M.M.c.f. while other wells may require 5 to 20 gal. per 1 M.M.c.f.

A rule of thumb could be to inject a minimum of 5 gal. per 1 M.M.c.f. on a lateral from 500 to 1,000 ft. long. On shorter lengths of 3-in. lateral, 2-5 gal. per 1 M.M.c.f. may prove sufficient. Setting of rates will depend on site of lateral, its length, the ruggedness of terrain, and the amount of water and hydrocarbon produced by the well. Because it is not practical to locate a pump on each well, individual pump rates are adjusted to rates sufficient to protect the portion of the system where they are located.

When several wells produce into a gathering system of various lateral sizes, the amount of methanol required will be influenced by the water and hydrocarbon that condense and remain as liquid in the lines. The amount of liquid that accumulates along a lateral increases with the length, the number of swags and dips, and the amount of gas flowing in the lateral keeping it swept clean. When fluid is present in a lateral, hydrates will form unless the excess fluid is removed or an equilibrium is established by in-



CAREFUL PLANNING PAYS OFF in preventing hydrate formation. Advance preparations cut the gas loss significantly in this instance.

jection of an antifreeze previous to the time hydrate temperature is reached.

Flow rates. A gathering system designed to handle 10 to 15 M.M.c.f.d. will probably require more antifreeze if the flow rate is decreased below the design. A decrease in flow can be anticipated as wells go dead or production is decreased with the age of the well. When gathering wet gas there will be portions of the system originally designed for a throughput of 10 M.M.c.f.d where the flow will decrease to one M.M.c.f.d. This lower production may be coming from as many as five different wells through different size laterals of various lengths. During winter such a situation can offer considerable hydrate difficulty. When hydrates form and must be cleared, systems operating with such a small throughput present the additional problems of insufficient purge gas and in the length of time required to repressure the lateral to return it to service and to ascertain if the hydrate will reform.

On portions of Texas Eastern's system, one well may be producing into a lengthy and elaborate amount of line. Extensive preventive measures may be required to keep such wells flowing during the winter. The amount of methanol required to keep an isolated well flowing can approach that of several wells flowing into another network of laterals.

Pump location. It is not necessary to install pumps on each lateral because the alcohol will prove beneficial along the system as it moves with the gas stream. As gas from additional wells enters, the effectiveness will become diluted. It becomes obvious then, that pump locations should be located at the most distant points of the lateral system first. The most distant pumps should be started first. As ground temperatures become lower the pumps along the lateral should be started and the pump rates adjusted to insure an adequate amount of methanol per M.c.f.d. that is flowing.

An equilibrium between methanol and the free water in gas can be in effect along a lateral and still sufficient hydrates will form to block the line. This can occur when the gas in equilibrium reaches the tap or check valve, where sufficient turbulence can be set up to precipitate hydrate formation. No amount of planning can prevent hydrate formations of this sort. If they can be discovered before the lateral is completely stopped a few gallons of alcohol introduced at the tap valve location will clear the hydrate and prevent complete stoppage of the line.

WINTER PIPELINE OPERATIONS ON THE WILCOX SYSTEM

Month—	Gal. Alcohol Injected 57-58	58-59	59-60	No. Laterals Frozen 57-58	58-59	59-60	Avg. Suct. Temp. Thomaston (°) 57-58	58-59	59-60
November	3,456	2,243	9,444	8	6	17	66*	68*	69*
December	12,680	17,295	19,298	39	75	26	59	61	62
January	26,441	35,134	24,361	105	112	52	56	55	58
February	31,188	28,011	25,448	101	59	52	54	57	57
March	22,068	17,082	34,746	57	15	57	57	61	57
April	6,917	1,784	2,230‡	2	0	0	64	64	63†
TOTAL	102,750	101,549	115,527	312	267	204			

*This temperature represents the entire month of November where it was considerably lower during the latter part when pumps were started.
†This temperature represents the first 10 days of the month.
‡This figure represents a total for the first 10 days of the month, as the pumps were off on April 11.

Watching for Problems

Even when the best plans have been made, with great attention to all details, there will still be considerable difficulty with hydrates. Meter charts from the field give information on those locations that are still having hydrate trouble. By using this chart information, alcohol-injection rates can be adjusted and other potential pump locations will be revealed. It is not possible to locate pumps for every spot where trouble will occur, but enough pumps should be installed to keep the main laterals hydrate-free.

When freezing occurs on laterals with supposedly sufficient alcohol being injected, they must be isolated and blown down to clear the hydrate. It is sometimes helpful after a hydrate is cleared to put several gallons or barrels of methanol, depending on the size of line, ahead of the purge gas to distribute some methanol along the line. When the lateral has been cleared and returned to service, pump rates should be adjusted to a rate that will prevent hydrates from forming again. An excessive rate for a few days will establish an equilibrium in the line and then the rates can be lowered.

Pump checks. To insure that all pumps are functioning properly, it is important that they be checked frequently. Since reserve tanks at each pump are small, they must be refilled frequently during hydrate months. Crews know how well the pump has been performing by the decrease in alcohol since their last visit.

Producers' well attendants often report pump stoppages to dispatching headquarters, and maintenance personnel immediately go to the field to make repairs. A hydrate condition can develop in just a few hours. It is very important therefore to keep all field equipment operating at all times and to repair equipment as soon as it is reported or found out of operation.

Cost factors. Each pump installation costs from 2 to several hundred dollars and must perform to repay the company's investment. Different capacity pumps are required because of the varied requirements of different locations, but the equipment is fairly standard. Reserve tanks, racks, hose, regulators, drip bottle, and copper tubing are required to complete each hookup.

Because most of the equipment can be used from year to year there isn't too great an expense for new equipment each winter. However, related expenses connected with winter operations on a wet-gas system can become astronomical if permitted to go unchecked. Overtime of employes can amount to several hundred dollars a week. Employes trained in pump maintenance will be invaluable to economical and efficient operations.

Any gas blown to the atmosphere in clearing hydrate blocks is lost to the pipeline and eventual sale or processing at some point on the system.

It is not practical to spend more money gathering the gas and transporting it than it will bring as a salable product, but it is necessary to protect, within reason, the initial investment at the wellhead. Accompanying graphs compare gas loss to atmosphere during winter, 1958-59, and the 1959-60 winter. These show that, in respect to gas lost, the past winter was more successful than the preceding one.

WINTER PIPELINE OPERATIONS ON THE WILCOX SYSTEM

Month	Hourly 1958-59	Overtime 1959-60
November	0	0
December	160	35
January	445	83
February	88	69
March	14	59
April	9	0
Total	**716**	**246**

NO PLACE FOR SISSIES

MOTOROLA 2-WAY RADIO TAKES A BEATING... because it's built to take it!

A 2-way radio is a precise, complex electronic instrument. But unless it is *rugged* too—unless it can shrug off jolts and vibration and come back for more—it just can't go to work in the oil fields.

Motorola engineers *design* a radio to take it. Extensive field tests *make sure* it's no sissy—Motorola literally beats the "bugs" out. Then a tough, rigid quality control setup *keeps* them out.

This kind of consistent leadership in research, development and engineering has led to a radio that will stand up to rough treatment and still deliver dependable service—day after day. You'll see *why* when you check with your local Motorola representative—he'll give you all the facts. Write:

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Illinois • A Subsidiary of Motorola Inc.

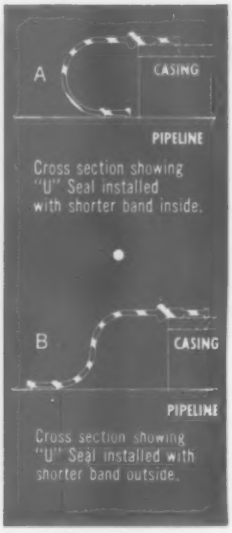
NEWS FROM DOWN THE LINE!

A NEW VERSATILE AND ECONOMICAL SEAL FOR CASED CROSSINGS...

THE NEW WmSON "U" SEAL

❶ "This new WmSon "U"-Seal maintains a tight seal regardless of what position the drag section assumes inside the casing."

❷ "This is a special demonstrator to show the flexibility of the "U"-Seal. Notice how it maintains its seal regardless of the change in pipe position in relation to the casing."



❸ " . . . Here the "U"-Seal is shown installed in the new "U" shape with the shorter band inside , which allows extreme flexibility. The "U"-Seal can also be installed with the shorter band on the outside in WmSon's familiar "Z" shape. In either case, only a screwdriver is needed to tighten the two stainless steel bands."

SIZES 2" AND LARGER

❹ Regardless of which way you install the "U"-Seal (Fig. A or fig. B) . . . . Regardless of what position the drag section assumes . . .

YOU CAN SEAL WITH A "U"-SEAL!

Write Dept. A for Bulletin A-281

T.D. Williamson, Inc.

P. O. BOX 40 TULSA 2, OKLAHOMA

REPRESENTATIVES AROUND THE WORLD

Hydrate formations in several gathering lines at one time can curtail gas flow so deliveries will be well below the amount requested of the system. When this situation occurs, adjustments will need to be made at other facilities to supply the demand at the sales end of the pipeline. It necessitates adjustments on the system at compressor stations and among employes to keep gas flowing into and through the pipeline.

When a portion of the main line experiences a hydrate block, the effect on gas deliveries is greatly increased and other repercussions are multiplied in importance. Many changes are required with producers' equipment, and the problems of communications with these suppliers are very troublesome.

Obligations. Just as the producer is obligated to keep gas flowing from the well into the system, so is the system obliged to keep the system operating to permit wells to flow. By injection of methanol and clearing of hydrates when they occur, the system fulfills its obligations to itself and the producer. There should be no lengthy interruption of service to cause monetary loss to either party.

Not only do hydrates present a problem to satisfactory gas flow, but they present a serious hazard to workers and pipeline facilities. Wellhead pressures are quite often very much greater than the operating pressure of the pipeline. When a hydrate block occurs the pipeline will be subjected to this pressure. Automatic pop valves on producers' equipment will normally not allow this pressure to exceed the pressure rating of the pipeline but any automatic device can fail. If these high pressures reach the pipeline, the relieving of them becomes a greater hazard to the workers.

When pressure is bled off a line containing a hydrate block, there can be a pressure drop of several hundred pounds across the block and it will still not be broken loose. When this occurs the block represents a terrific force which will be exerted on the pipeline when it breaks loose.

Pressure relief. When freeing a hydrate block it is best to relieve pressure on both sides of the block to prevent an unsafe pressure differential. If two crews can work on each problem, close attention to pressures on both sides of the block can be maintained. In most instances two crews are not available and other safeguards or arrangements need to be made. An economical and practical remedy is to equip each two-man crew with a walkie-talkie, thus making one crew serve as two.

It is very important that each crew be supplied with sufficient and proper hand tools, automotive equipment, pressure gages, and to have good communications. Most important in this dangerous work is to have intelligent and well trained personnel. Technically trained men can be taught more readily to respect the potential dangers of high pressures and to figure out field problems as they arise. In addition to their measurement work, Texas Eastern uses its measurement engineers, who are technically trained and have a college background, to handle hydrate problems during the hydrate season.

Design of System

Many of the problems on a wet gas system would be simplified if the pipeline design considers the special problems of wet gas. Such things as pig traps on major laterals make it possible to sweep condensed liquids out of the line just before the hydrate season begins. Using gate valves rather than plug valves for tap valves removes a source of turbulence and pressure drops that might encourage formation of hydrates.

The economics of using various antifreezes should be investigated and the system designed with the type of antifreeze to be used in mind. If methanol is to be used, spray nozzles should be provided or allowed for at potential injection points. Pumps and related equipment might be sized better if purchased after the system is in operation.

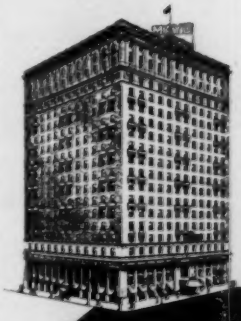
Orifice meters, valves, and condensing chambers should be purchased and installed with wet-gas measurement in mind. The bellows or diaphragm-type meter, in conjunction with condensing chambers, and valves that will be serviceable under the conditions of wet gas permit accurate measurement in most cases. Special conditions will arise that must be worked out after operations are begun.

Best year. The 1959-1960 winter was probably Texas Eastern's most successful so far as pipeline operations, gas measurement, and hydrate control are concerned. There were 60 fewer hydrate blocks to clear and gas loss to clear hydrates was one half the previous winter. This was accomplished under winter conditions that were, over-all, more severe than the previous ones. This success was due to advance planning, starting pump injection before hydrate troubles started, and keeping pump rates constant. Measurement engineers were able to keep up their measurement work because they were not working with hydrates as much.

There were considerable savings to the company in overtime hours. It was also possible for employes to do the work during daylight hours when the handling of high pressures is much safer.

Several innovations were made that should prove of benefit in later years. Different pumps for injection were tried and found to be more economical in maintenance and require less gas to operate. Pumps of a small capacity, up to a maximum of 10 gal. per day, proved successful on laterals

THE HOTEL



in the Oil Capital of the World

100% Airconditioned
600 Bright *Reasonably* Priced Rooms

THE MAYO

TULSA'S *Finest* HOTEL
Sample Rooms - Finest Food
Adjacent Garage

S. E. HUEY & CO.

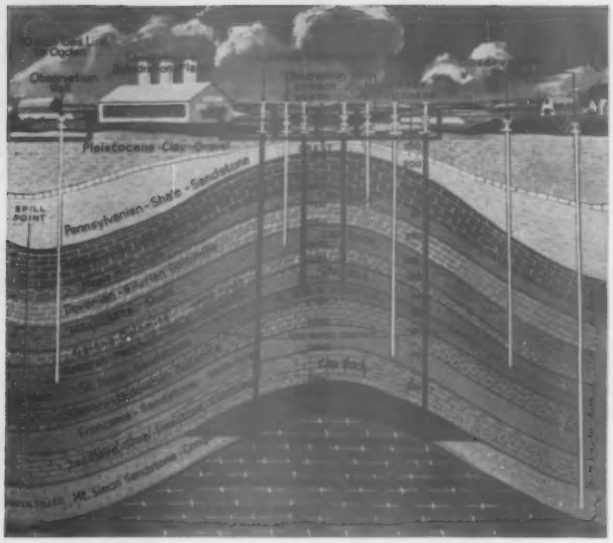
ENGINEERS & SURVEYORS

OUACHITA BANK BLDG.

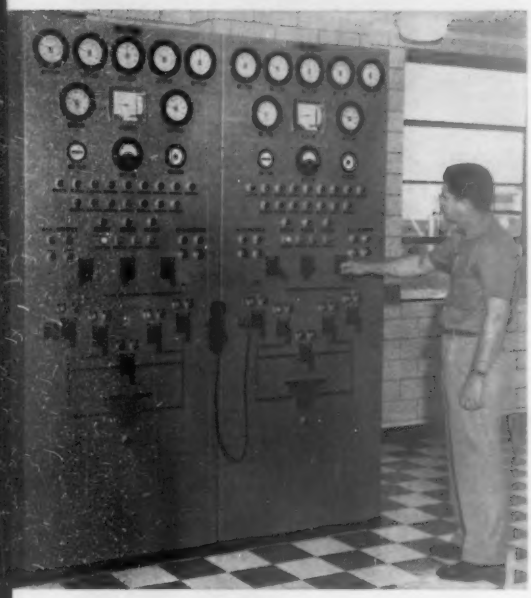
MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS



▲ Cutaway drawing of underground storage reservoir at Redfield. This station injects into St. Peter and Mt. Simon sandstone at 59 wells. Ultimate capacity of both strata is about 140 billion cu. ft.



M. H. Raven (right), Superintendent of Northern Natural Gas Company's underground storage compressor station near Redfield, Iowa, until his recent promotion, discusses the facts with H. E. Hansen, Shift Engineer. Compressor in foreground is GMWA-8, rated 2000 hp. Another similar unit is in the background. ▶

◀ Cooper-Bessemer En-Tronic control provides complete start-stop, loading—unloading automation for the engine driven compressor.

How a rugged compressor aids a variable-load gas storage program

During its first year's operation, Redfield Station of Northern Natural Gas Company has been put through a rigorous test. According to M. H. Raven, Superintendent, "Our Cooper-Bessemer GMWA-8 Compressor and En-Tronic Control have responded round-the-clock to this program of normal loading, underloading and overloading with remarkable performance. Despite abnormal loading, oil consumption and water usage have been very low. Inspection and cleaning after 12,000 hours showed all parts in perfect condition. It is a *rugged* machine!"

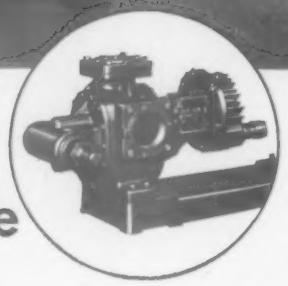
Call our nearest office for help in applying this kind of dependability and load flexibility to *your* compressor operations.

BRANCH OFFICES: Grove City • New York • Washington Gloucester • Pittsburgh • Detroit • Chicago • Minneapolis • St. Louis Kansas City • Tulsa • New Orleans • Shreveport • Houston Greggton • Dallas • Odessa • Pampa • Casper • Seattle San Francisco • Los Angeles • SUBSIDIARIES: Cooper-Bessemer of Canada, Ltd. . . . Edmonton • Calgary • Toronto • Halifax Stratford • C-B Southern, Inc. . . . Houston • Cooper-Bessemer International Corporation . . . New York • Caracas • Anaco • Cooper-Bessemer, S.A. . . . Chur, Switzerland • The Hague, Netherlands Mexico City • The Rotor Tool Company, Cleveland

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL,
ENGINE, TURBINE OR MOTOR DRIVEN



SERIES 3600

transfer pump from field storage to pipe line anytime... anywhere

CAPACITY: 40-300 GPM • PRESSURES TO 100 PSI

Before a Roper pump leaves the plant, it is subjected to rigid quality control tests simulating the rugged oil field conditions the unit must withstand. These tests assure you of a pump that pulls its own weight when it is put to transfer work, despite long hours of continuous operation. Construction is rugged but simple, so that field servicing can be done quickly and easily. The bulk plant models in the Series 3600 line are furnished on steel bed plate with or ready to receive motors. Equipped with totally enclosed anti-friction gear reduction for high-speed operation. Three gear ratios interchangeable in each size are available. Mechanical seal, built-in relief valve, and steam chest are among the outstanding features that can be supplied on Roper Series 3600 pumps.

QUALITY-CONTROLLED FEATURES

- Two equal size hardened iron gears running in axial hydraulic balance
- Four high-lead bronze bearings support pumping gears on both sides
- Hardened steel shafts
- Heavy-duty bronze sleeve bearings

For information about your specific pump needs, contact your nearest Roper dealer

ROPER HYDRAULICS, INC.

Dependable pumps since 1857

COMMERCE, GEORGIA

Contract Research, Development and Fabrication

of instrumentation in the Petroleum Industry

Specializing in the fields of mechanical, electronic, optical, and electro-mechanical development.

BALL BROTHERS RESEARCH CORP.

INDUSTRIAL PARK • BOULDER, COLO.
Hillcrest 2-2966

A subsidiary of
BALL BROTHERS COMPANY, INC.

of a few hundred feet in length that had been a daily hydrate problem.

Problems met. Texas Eastern has shown it is possible to gather wet gas economically and to maintain required flow rates even during winter months. Considerable difficulties with the handling of a two-phase system were overcome and hydrates are being effectively controlled by use of methanol injection. It is possible that another method of hydrate prevention would prove more economical, but the company's studies to date have not been able to prove a more effective method. Much money is invested in the operation Texas Eastern now has, and therefore, any change would have to show big savings to be justified.

Other systems with gas-hydrate problems should study the use of heat, glycol injection, and methanol injection to determine which would be the most economical and practical method. Glycol injection would be very effective, and it is quite possible that an economical and practical method could be developed. The main drawback of glycol compared to methanol is the cost per gallon. If the glycol could be recovered for reuse this item might be overcome.

All the methods mentioned are effective so it becomes a matter of economics and application as to which method to choose. An older system, with one type of hydrate prevention already in operation, might find it too costly to change. Any new system should incorporate some plan in the original design. Success of operation will depend, to a great extent, on training personnel and developing operating techniques. New ideas and innovations will be required to insure operations are kept up-to-date.

Texas Eastern's success this past winter is attributed to advance planning, having a meeting to formulate winter plans, and beginning methanol injection before the hydrate point had been reached. Considerable success was experienced with a different brand pump and with pumps of small capacity. Next winter should prove easier and more economical.

References

1. Maynard Stephens and Oscar Spencer, Natural Gas Engineering, Third Edition.
2. Natural Gas, University of Kansas—University Extension, Chapter 19, "Dehydration and Desulfurization of Natural Gas," pp. 2-6.
3. Gerald Hollis, "Problems in Wet Gas Measurement at Extremely High Pressures," Southwestern gas-measurement short course, 1948.
4. Laurence S. Reid, "Pre-Dehydration Use of Hydrated Inhibitors," Southwestern gas-measurement short course, pp. 271-275, 1954.

Why DARLING-McEVOY 2-way conduit gate valves

JUST CAN'T LEAK!

Section view of Darling-McEvoy 2-way conduit gate valve, showing twin sealant reservoirs, double-gate parallel seat design, and sealing grooves. Sizes: 8 inch and larger.

IT'S simple. Regardless of flow direction, a sealant *automatically* completes a pressure-tight seal between the downstream seat and gate. This is the inevitable result of pressure differential at the time of closure.

Similarly there can be no behind-the-seat leakage! For, as shown here, each seat is *double-grooved* to seal against the valve body as well as the gate.

It is this unique feature, with its positive, automatic self-sealing, that establishes the Darling-McEvoy conduit gate valve as the world's tightest!

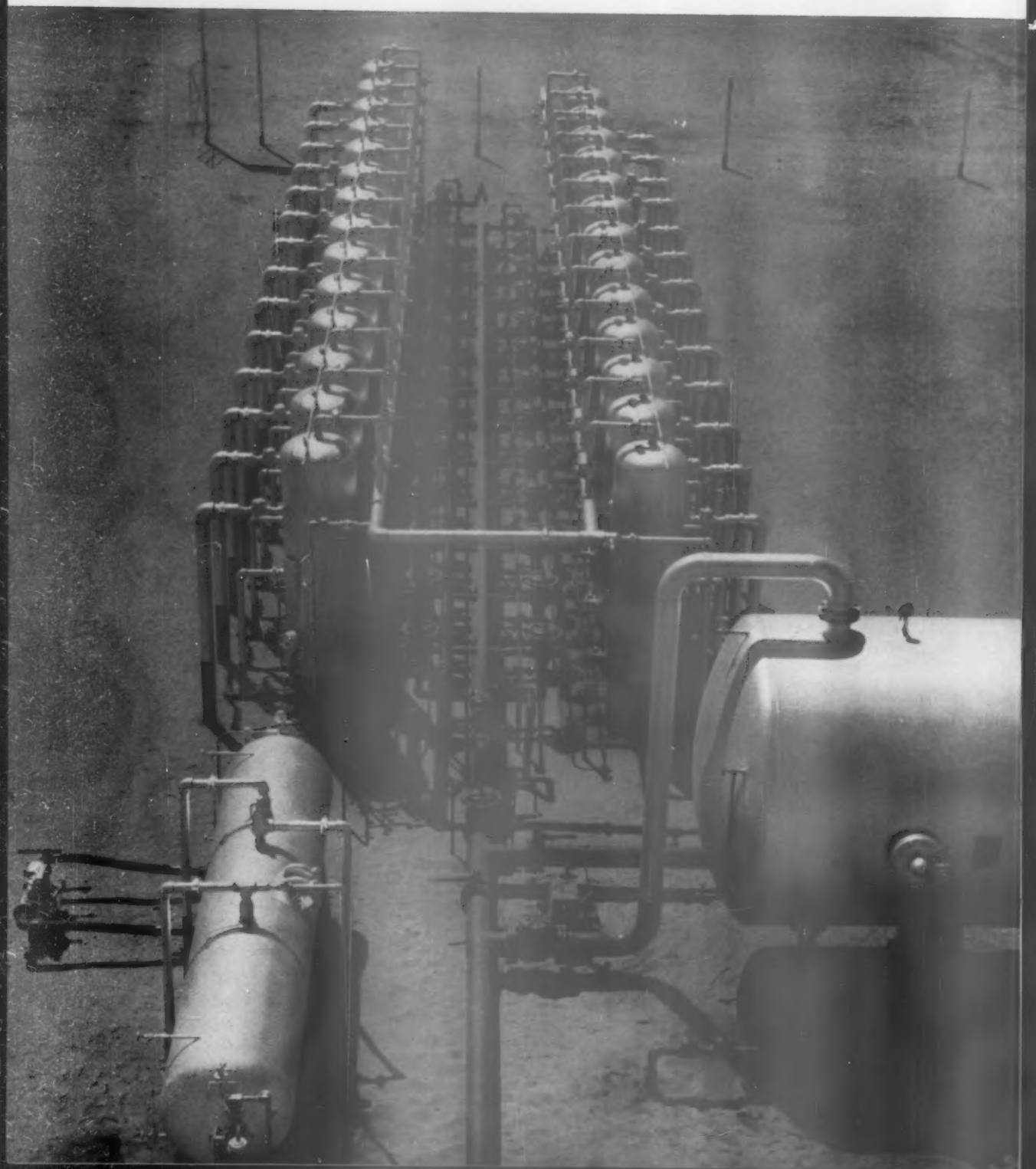
Isn't it likely that you could benefit by such valve performance as time goes on? Get the *whole* story . . . get details on this and the other unusual features that make these field-proved valves truly outstanding for low-cost, trouble-free operation. Just ask for Bulletin 5402.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

automatic – economical
it's Foxboro Gas-Oil



– maintenance-free...
Separator Control

Three simple, low-maintenance Foxboro instruments — that's all you need in Foxboro's automatic oil-gas separator control system.

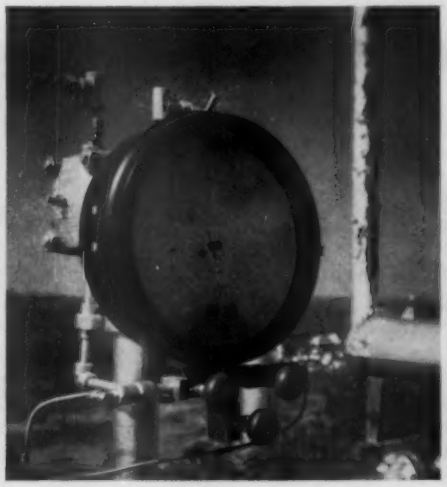
1. The Foxboro d/p cell* controller to regulate tank level and, where desired, provide automatic emergency shut-off of incoming production
2. The Foxboro M/41A Controller to maintain constant, even back-pressure in the separator
3. The Foxboro T/37 Diaphragm Meter for accurate indicating measurement of gas flow leaving the separator

Three, simple, low-cost, low-maintenance instruments to control the whole separation process — economically, automatically.

Ideal for a single separator, or for a whole battery of them. Ask your nearby Foxboro Field Engineer for details. Or write for Bulletin 1-28. The Foxboro Company, 6011 Neponset Avenue, Foxboro, Massachusetts.

For Oil Level Control . . .

d/p cell measures change in separator level and operates Foxboro control valve in oil draw-off line. When valve is equipped with Foxboro Valvactor* positioner oil in separator can be controlled through any desired range of level.



For Gas Flow Measurement . . .

the Foxboro T/37 Diaphragm Meter. Keeps accurate chart record of gas flow leaving separator. Meter uses no mercury — cannot be damaged by overrange. Simple, rugged, responsive — it seldom requires maintenance of any type.

For Back-Pressure Control . . .

the Foxboro M/41A indicating controller. Maintains close control of pressure in separator by operating Foxboro Stabilflo* control valve in output line. Smooth, even gas flow is assured. Separator back-pressure may be easily preset from index pointer on controller.

Reg. U. S. Pat. Off.

FOXBORO

REG. U. S. PAT. OFF.

How a "Wedding Band"...

gives double strength to

AMERICAN IRON

Flash Welded Tool Joints!

An induction coil or "Wedding Band" is a new strengthening process used by American Iron for heat treating their Flash Welded tool joints at the weld line.

The induction coil heats the weld line and the heat affected areas from flash welding, to approximately 1700 degrees in a very short time.

This process improves the physical properties of the material by refining the grain size which has been enlarged during the weld cycle. It causes a "wedding" of the grain structures across the weld interface. There is no longer a weld line . . . but now a ductile, strong weld zone.

The entire heat-treating process more than doubles the tensile-impact strength of the Flash Welded connection. This is just one of the many exacting processes and tests used at American Iron in the manufacture of tool joint-to-pipe connections. Another reason why you buy QUALITY when you specify AMERICAN IRON.

Specify Flash Welded OPEN-HOLE *Tool Joints for your Lightweight Drill Pipe*

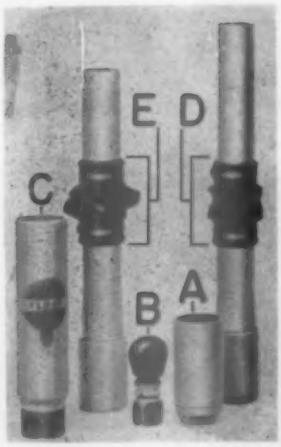
AVAILABLE THROUGH YOUR SUPPLY STORE

▶▶▶ New Equipment Section

This week's SHOWCASE features . . .

New line of lift trucks

. . . is available, equipped with either a gasoline or a diesel engine of 172 cu. in. displacement, in four stacking heights, 10, 12, 16, and 21 ft., and with two or three-stage masts. Loads of 4,000 lb. can be handled by the 10 and 12-ft. lift trucks. For handling bulk materials and all standard size pallets and skid boxes, adjustable forks or 42 and 60-in. face plates are available. Source: **Tractor and Implement Div., Ford Motor Co., Birmingham, Mich.**



Cementing equipment

. . . for primary cementing of tubingless completions recently announced includes a variety of products. These include a tubing guide shoe (A) that can be made full opening by pumping a ball to the shoe and applying pressure to shear the guide out of the shoe. The shoe is usually run with a full-flow tubing fillup collar (not shown) with cementing plug which contains a drillable baffle plate that acts as a plug seat for the cementing and backpressure plug (B),

The tubing cement float collar (C) uses a ball type of backpressure valve for floating and cementing. A turbulizer (D) is used to reduce channeling when cementing multiple tubingless completions by spacing the tubing strings apart so cement will flow evenly around each tubing string. Source: **Baker Oil Tools, Inc., Box 2274, Terminal Annex, Los Angeles 54, Calif., U.S.A.**

●

Clean, controlled gas supply

. . . can be obtained with a new filter regulator now on the market. It is applicable where a controlled supply of clean air or other gas is needed.

The Model 080 filter regulator promises to prove particularly useful for instruments and air cylinders. Constructed of pressure die-cast aluminum, the unit has a maximum inlet-pressure rating of 250 psi. and three outlet-pressure ranges: 0-5, 5-35, and 35-100 psi. Source: **Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.**

●

Valve operator

. . . installed quickly in the field while valves are in service. Only commonly available hand tools are needed to install the operator, according to the maker of this new Converto-Gear operator. It is designed to provide power assistance in opening and closing iron and steel outside-screw-and-yoke and nonrising-stem gate valves with stem diameters up to 2½ in.

With a gear ratio of 4.11:1, the

Want more facts about equipment or copies of product literature described in this issue?

Send this Showcase Coupon

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number .....

.....

Described in OIL and GAS JOURNAL - issue of **November 7, 1960**

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

NEW FROM CHEVROLET

!!! WING-DING OF A TRUCK IDEA !!!

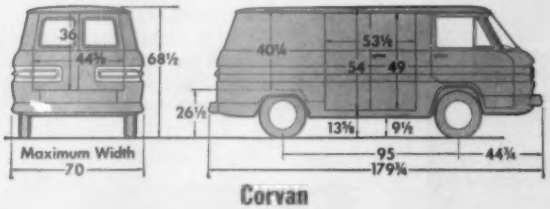
Here's a totally new kind of truck that gives you more load space than a conventional half-tonner, plus the inherent economy of an air-cooled engine! A truck that will carry up to 1,900 lbs. of payload (with a trim 4,600-lb. G.V.W.) on a nimble 95-inch wheelbase. A truck that measures only 15 feet long and devotes nearly 9 feet of it to payload! Dollar-saving performance starts with the engine—a space-saving "pancake" 6 that never needs anti-freeze or radiator repairs . . . and never stops saving fuel costs! Ideally suited for trouble-free truck duty, also, is the *tough* chassis build of Corvair 95, which includes frame and body designed as a rugged one-piece unit to

DRIVER'S UP FRONT . . . ENGINE'S IN THE REAR

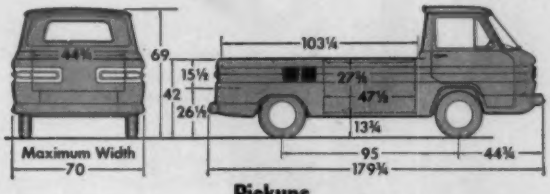
CORVAIR 95 TRUCKS

withstand slam-bang runs. And there's *4-wheel independent suspension* (first time in a U.S. truck!) to take the roughness out of road surfaces. The list of Corvair 95 design advantages is as long as your arm. There's load space so accessible that the truck practically loads and unloads itself! There's exceptional driver comfort, easy maneuvering, snappy styling, and much, much more. It's a wing-ding of a truck idea—available in pickup and panel body versions. Visit your nearby Chevrolet dealer soon and get all the details. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

★★★



Corvan



Pickups

New Corvan. There's a world of load space in this new Chevy panel—it's 109″ long, 60″ wide and 54″ high at center! Side doors take a 4′ x 4′ crate with ease. Left side doors are optional at extra cost.

New Rampside pickup. Roll out those heavy loads—there's nothing to it in this one! Ruggedly built side gate drops down to form convenient ramp for *easy* loading or unloading.

New Loadside pickup. Gives you more load space than a conventional half-tonner. Also, optional extra cost *flat floor* provides 39 sq. ft. of loading area, and you can stow cargo underneath it, too.

Less truck weight allows more cargo weight! Corvair 95's weigh up to 1,200 lbs. less than other half-tonners . . . yet they'll carry up to 1,900 lbs. of cargo!

50-50 weight distribution! Husky 2,500-lb.-capacity front and rear suspensions carry nearly equal loads to reduce strain on chassis and tires.

More load space, less road space! Corvair 95's are 2 feet shorter than conventional half-tonners. But Corvair 95's carry bulkier cargoes!

Easiest to get around in! Turning radius (under 20 feet) is less than that of ordinary trucks. That means easier maneuvering and parking.

1961 CHEVROLET STURDI-BILT TRUCKS

CHEVROLET

Short, compact, less to drill up

Type BC

OTIS

Wire Line Bridge Plug

Small O.D. offers ease of running.

Can be set with any pressure setting tool.

The Type BC Otis Wire Line Bridge Plug is designed to take the guesswork out of plugging, yet it costs you no more than an ordinary plug. It's short and compact — less to drill up — and has an unusually small O.D. for ease of running. The Type BC has been successfully run on many occasions where other plugs failed to get down. And a feature you will particularly like is that the Type BC Otis Bridge Plug covers a wider range of casing weights than any other plug available today. This feature alone has saved many times the cost of a plug where accurate casing weight records were not available.

AVAILABLE FROM ALL ELECTRIC LINE SERVICE COMPANIES — STOCKED AT 247 FIELD LOCATIONS. Not only are Otis Wire Line Bridge Plugs available through any electric line service company, but stocks are maintained at 247 different field storage locations so that you can set an Otis plug whenever you need it — wherever you need it. And Otis bridge plugs can be set on any type of pressure setting tool. So the next time you need a bridge plug to prevent movement of fluid or gas from either direction in the casing, or to plug and abandon — play it safe — specify an Otis Wire Line Bridge Plug.

©1960 O.E.C.

OTIS ENGINEERING CORPORATION

General Offices: 6612 Denton Drive, Dallas

Branches Throughout the Oil Country

operator is adaptable for either pneumatic or electric power-wrench operation. Source: **Crane Co., 155 N. Wacker Dr., Chicago 6, Ill.**

●

Portable drill

. . . for coring and masonry drilling now available handles continuous flight augers from 3 to 12 in. and drives 6-in. augers to a 30 ft. depth. Equipped for core drilling, the unit, tradenamed Minuteman, will drive a core barrel to a depth of 200 ft., the maker claims.

The machine weighs 150 lb., is powered by a 6-hp. engine, uses an eight-speed transmission, and provides a 44-in. stroke with power or hand feed both into and out of the hole. Source: **Mobile Drilling, Inc., 960 N. Pennsylvania, Indianapolis 4, Ind.**

●

Gaskets protected

. . . by plastic bag are now available. The bag has affixed to it double-sided labels. These show the gasket size and style, making identification easy. This is an important advantage to users as

they will be assured that the gaskets are clean. Too, the labels make it easy to locate gaskets stored on shelves. Source: **Oteco Equipment Co., 2438 Summer, Houston, Tex.**

●

Portable radiophone

. . . with receiver squelch is available. Rated at 100 milliwatt, the VP-100 radiophone is crystal-controlled, and, according to the maker, has an average range of ½ to 3 miles. Operating on any of the 22 channels of the citizens' band, it is fully transistorized and self-contained, except for the lapel microphone.

The maker points out that two or more of the units may be operated in communication or in conjunction with base stations of 100 milliwatts of power without licensing. A 9-volt battery powers the radiophone. The circuitry is printed on glass fiber. Source: **Morrow Radio Mfg. Co., Salem, Ore.**

●

Dependable liquid level control

. . . is promised by a new single-stage, external-float-cage control now on the market. The Model 1752 instrument is designed to provide an antivibratory, corrosion-resistant liquid-level control as a high-level alarm on scrubber service with 0.6 sp. gr. hydrocarbon liquid at 500 psi., with high ambient temperature conditions.

The control can be equipped either

WECO AIR-O-UNIONS

Perfect for low pressure lines

WECO Air-O-Unions have everything you want in quick, easy make-up, perfect sealing unions for low pressure lines, such as mud suction and return lines; for connecting mud tanks and other services where fluid pressures are low.

No bolts, nuts or wrenches are required. No close line-ups are necessary. Just a shot of air seals the inflatable tube . . . deflating it releases the seal for break-out.

With WECO Air-O-Unions permanently welded in place on your mud tanks, suction and return lines and fittings, mud systems are set up with less time, trouble and cost than ever before. Switch to low cost, time-saving, simple Air-O-Unions on all of your low pressure lines. **They are available in sizes 6" through 16".**

Your Supply Store has WECO Air-O-Unions . . . or ask your WECO or Chiksan representative.

WECO

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

AD-3-59

as an electric or as a pneumatic control. A new electric switch mechanism developed for the control provides a magnet-actuated, two-position, snap-action mercury switch with high reliability, according to the maker. Source: **Magnetrol, Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.**

●

New wellhead

...for tubingless completions now on the market is designed to permit slip or mandrel hanging of the production strings and to provide ample openings for centralizers or turbulizers. According to the maker, tubing can be run either individually or together at the same time, and strings can be hung without spacing out.

In addition, the head is said to permit hanging one to four strings in the same head and to permit testing of field makeup connections. Source: **Oil Center Tool Co., P. O. Box 3091, Houston 1, Tex., U.S.A.**

Self-propelled welder moves easily

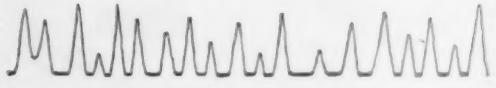
...in the field from one job to another widely separated point. The new model Weldmobile has a rated towing capacity of 2,000-lb. draw-bar pull which permits towing.

The engine in the unit is directly coupled to the generator. The welder comes in two ratings: 600 and 400 amp. Besides power for welding, the machine can supply 1 kw. of auxiliary power at 110 volts d.c. for operating lights and electric-motor-powered equipment. Source: **Hobart Bros. Co., 1221 Hobart Rd., Troy, Ohio.**

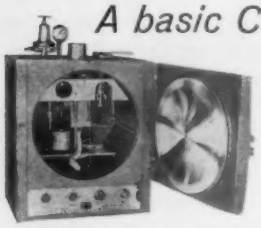
Plastic pipe

...for oil-field service is made of Delrin aceyal resin and is joined by a heat-fusion fastening method which is claimed to yield a strong joint.

The Delrin resin is a rigid thermoplastic which reportedly combines high strength and toughness with excellent fatigue endurance under pressure-surging conditions. Potential uses for the pipe include flow lines, gathering lines, salt-water disposal, and water-flooding lines. Source: **E. I. du Pont de Nemours & Co., Wilmington 98, Del.**



A basic Chromatograph



AT A BASIC PRICE

This versatile analytical technique is now available to your research or quality control department in Cenco's vapor phase analyzer complete with gas sampling valve at a reasonable price.

When needed, an extensive line of quick change analytical and preparation columns, bubble flow meters, syringes, and recorders are available for you to tailor this basic chromatograph to your requirements.

Ask your Cenco representative for Booklet 275B describing the No. 70130 Vapor Phase Analyzer.....$1,029.00

cenco

REFINERY SUPPLY CO.
A Subsidiary of Central Scientific Co.
621 East 4th Street • Tulsa 20, Oklahoma
2215 McKinney Ave. • Houston 3, Texas
Branches and Warehouses—Mountainside, N. J. Boston • Birmingham • Santa Clara • Los Angeles • Chicago

Non-Burst

SUPER-MASTER

BW STEAM HOSE

- PRACTICALLY BURST-PROOF
- STATIC WIRE
- STEEL WIRE BRAID REINFORCED
- BUTYL COVER
- FOR PRESSURES TO 200 LB—(388° F)

WRITE FOR BULLETIN M630

Unusual strength and flexibility . . . maximum safety. Preferred by safety engineers for flash-fire protection, clean-up in refineries, steel mills, foundries . . . dock-to-ship steam supply lines. Made with Neoprene cover for refinery service. Master brand for 150 lb. pressure. Special Type for Pile drivers. Other engineered variations for special applications (higher pressures, temperatures, etc.) on request.

RM1036

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY
ENGINEERED RUBBER PRODUCTS . . MORE USE PER DOLLAR

RM

Oilmen KNOW

As salt-water well tubing, as salt-water gathering and disposal lines, as oil flow lines . . . Western ABS semi-rigid plastic pipe is without equal in the oil fields!

Western Semi-Rigid PLASTIC PIPE Saves

MONEY

Semi-Rigid pipe made of ABS plastics costs less to buy, and costs less to install. It needs no expensive bedding, less ditching . . . never requires costly handling equipment. And it's greater serviceability virtually eliminates the need for replacement.

TIME

Effortless to carry . . . quickly jointed, two men can lay several thousand feet of ABS pipe in a single day. Easily sawed, drilled or threaded, it is permanently solvent-welded in seconds. Ready-to-use ABS pipe fittings require only the simplest tools.

TROUBLE

Western ABS has superior resistance to corrosion, chemicals and crude oil . . . will not rust, or scale and is free from electrolytic action. It's smooth interior means lower friction, faster flow. Western ABS has both high impact and high tensile strength as well as high temperature resistance.

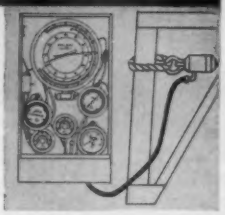
For further information write, wire or call:

WESTERN PLASTICS CORPORATION

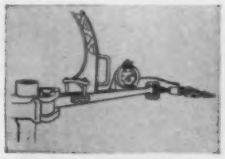
1515 W. 2nd Street • Hastings, Nebr. • Phone 3-1361

TONG TORQUE

THE MARTIN-DECKER TONG TORQUE ASSEMBLY FOR ALL CONNECTIONS



PERMANENT INSTALLATION The cylinder attached to the back-up line provides torque indication each time collars are run.



ONE GAUGE for torque measurements of all size drill collars, drill pipe, tubing and casing.

ACCURATE AND RELIABLE readings with calibration checks seldom required.

CARE AND MAINTENANCE can be capably done by the drilling crews.

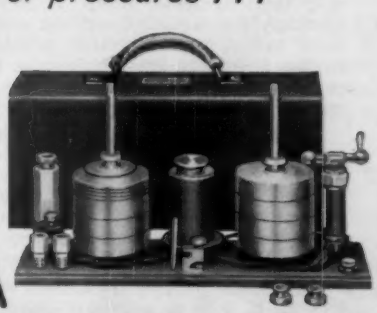
PORTABLE INSTALLATION The torque assembly attached to the tong itself can be used for spot checks on two or more rigs.

MARTIN DECKER

WRITE FOR DESCRIPTIVE LITERATURE D-P95
MARTIN-DECKER CORPORATION
3431 CHERRY AVENUE, LONG BEACH 7, CALIF.

World's principal manufacturer of Oil Well Drilling Instrumentation

For precise measurement of pressures . . .



DEAD WEIGHT GAUGE

Portable instrument conveniently measures line pressures, rock pressures at wells, static pressure on orifice meters, and gas pressure on pipe line leakage tests. Maximum pressure: 500, 1000 and 1500 psi. Graduations: 1 or 1/10 psi. Write for information.

No. 35230-1 $140.00 (*Prices to* $337.50)

cenco

REFINERY SUPPLY CO.

A Subsidiary of Central Scientific Co.
621 East 4th Street • Tulsa 20, Oklahoma
2215 McKinney Ave. • Houston 3, Texas
Branches and Warehouses—Mountainside, N. J. Boston • Birmingham • Santa Clara • Los Angeles • Chicago

BONDSTRAND®

An imaginative solution to your piping problems

From Missile Research...
A new product for process piping

- Twice as strong as steel
- 1/4 the weight of steel
- Inherently resistant to chemicals which attack stainless steel

Bondstrand is a corrosion-resistant, high strength, rigid pipe made of glass filaments bonded in chemically inert synthetic resins. It is capable of withstanding high pressure and the corrosive attack of many salt, acid, and alkaline solutions. The outside surface is equally resistant because the pipe is made entirely of corrosion-proof materials. No painting or maintenance is necessary.

Bondstrand's light weight and ease of assembly can save up to 50% of installation costs. Actual cost records of typical applications prove that the total installed cost averaged only 1.3 times that of carbon steel pipe. By eliminating the corrosion problem and down time for replacement or repair, Bondstrand saves many times its slightly higher initial cost.

Bondstrand is now available in sizes from 2" through 8" with all necessary couplings and fittings. Larger sizes available on special order.

Write for bulletin containing complete data, including physical properties, chemical resistance, flow rates, and other design information.

Amercoat® CORPORATION 126

A Subsidiary of American Pipe and Construction Co.

Dept. CK, 4809 Firestone Blvd., South Gate, California

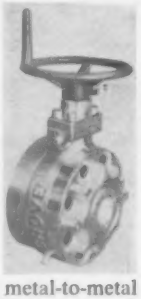
921 Pitner Ave. Evanston, Ill. | 360 Carnegie Ave. Kenilworth, N. J. | 111 Colgate Buffalo, N.Y. | 2404 Dennis St. Jacksonville, Fla. | 6530 Supply Row Houston, Tex.

Compound pressure gage

. . . for pressures up to 20,000 psi. incorporates a four-to-one vernier pointer which is designed to provide the sensitivity of a lower-capacity instrument. Providing an accuracy of ½%, the gage comes in ratings from 4,000 to 20,000 psi. Metric equivalents are available too. Source: **Martin Decker Corp., 3431 Cherry Ave., Long Beach 7, Calif., U.S.A.**

●

Compact gate valve



. . . for general production and pipeline service, the Model G-6, is substantially smaller in over-all height and width than conventional regular port valves.

A nonrising stem type, the valve uses metal inner seat rings to give a primary metal-to-metal seal backed up by O-rings. It comes in a 2-in. size in API 3,000 lb. and 5,000 w.p. flanged and ASA Classes 900 and 1,500-lb. flanged ratings. Source: **Grove Valve & Regulator Co., 6529 Hollis, Oakland, Calif.**

●

Formation chemical

. . . recently announced is designed to clean up formations blocked by paraffin, sulfides, mud, and water. The product, Stim-Form, may be applied by gravity down the annulus and circulated or by squeezing into the formation, given contact time, and then circulated.

The product is said to be applicable to cleaning up old wells that are to be converted to water injection wells and for use in the water-flood production wells to keep the formation clean and aid in the flow of the crude oil. Source: **Brakesol, Inc., Box 9506, Oklahoma City 18, Okla., U.S.A.**

Prebuilt building

. . . for use as a service station has been placed on the market that can be put into operation within 2 weeks, the maker claims. The building contains panel ray heat, insulation in the roof, floor and side walls, two restrooms with fixtures, and floor-length windows. It rests on an I-beam foundation. In addition, it contains complete wiring and plumbing of more than 30 outlets which, the maker says, meet all electrical and plumbing codes. Source: **Fairchild & Associates, Box 13424, Fort Worth, Tex.**

Sprayable epoxy resin

. . . is now available that promises to provide easily applied epoxy corrosion protection for pipe fittings, supports, and other equipment and piping. The Scotchkote No. 101 resin is a one-part powdered epoxy resin that can be sprayed on heated parts with a flocking gun. The maker says the resin flows evenly to give a uniform, smooth coating which cures in less than a minute. Source: **Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.**

Latest fracture initiation tool

. . . disclosed, called the Triple Frac-Notch cutter, is reported to have proved exceptionally efficient in field operations in hard sandstone and limestone formations. The tool operates on an electric wire line. On one run of the tool, it makes three separate notch cuts simultaneously.

Each notch cuts through casing and cement and cuts fractures up to 15 in. into the surrounding formation. Three notches are cut on a horizontal plane at the same depth in the well. The tool is available for use in tubing sizes from 2 to 3½ in. and in casing sizes from 4½ to 7 in. o.d. Source: **McCullough Tool Co., 5820 S. Alameda, Los Angeles 58, Calif., U.S.A.**

POLY PLUG
FOR PREVENTION AND CONTROL OF LOST CIRCULATION
NEW!
POLY PLUG
*TRADEMARK
ANOTHER MAJOR DEVELOPMENT IN LOST CIRCULATION MATERIAL!
(PATENT APPLICATION IN PROCESS)
• Using laboratory and field data, Cherokee has, by an engineered blending process, developed Poly-Plug for the prevention and control of lost circulation.
• Cherokee's Poly-Plug is an engineered homogeneous mixture of components chosen as having been individually accepted to be the most effective materials used in certain cases of lost circulation.
• The combination of materials which make up Poly-Plug are: 1. Ground and graded granular plastic. 2. Ground and graded hard nutshell. 3. High stength inert fibre.
Cherokee's Poly-Plug is available in the coarse (maximum particle size ¼") grade only and is offered at a very nominal cost.
• For further information, contact your local mud company or the Cherokee Laboratories' representative nearest you.
CHEROKEE LABORATORIES, Inc.
P. O. Box 587 • Tulsa, Oklahoma • LUther 4-7285
BRANCHES: CODY • CASPER • GRAND JUNCTION • OKLAHOMA CITY
ODESSA • MIDLAND • McALLEN • CORPUS CHRISTI • HOUSTON • DeQUINCY • LAFAYETTE • NEW ORLEANS

HEALTH BOARD TO DEMAND ACTION IN POLLUTION CASE
CRIMINAL NEGLIGENCE CITED AGAINST FIRM IN EXPLOSION
FACTORY'S WASTE DISPOSAL BLAMED FOR WATER POLLUTION
SMOG RESPONSIBILITY LAID TO IMPROPER WASTE DISPOSAL

WASTE DISPOSAL . . . A MAJOR PROBLEM IN THE PROCESSING INDUSTRIES

As local air and water pollution regulations become more stringent, the efficient disposal of waste products becomes an increasing problem. Safety for plant and personnel is also an important aspect of waste disposal. Danger to your employees from noxious fumes . . . the possibility of explosions . . . are constant hazards when waste disposal is not properly handled.

WHAT IS THE ANSWER?

Let John Zink engineers solve your special waste disposal problem.

Each process has its own waste materials. Each plant has its own physical limitations as to space, available fuels, etc. Each community has its own legal restrictions.

The only sensible answer is a waste disposal unit designed to meet *your* individual requirements.

The John Zink Company has been a leader in the waste disposal field for more than a quarter of a century. One of the first to recognize *and solve* this problem, John Zink engineering and research has met the waste disposal needs of processors throughout the world with units of standard or custom design for maximum efficiency and safety.
WRITE FOR BULLETIN WD-560

COMPLETE RESEARCH FACILITIES . . .

The country's most complete research and test center devoted exclusively to combustion problems . . . your assurance of a workable solution to your special combustion problems.

Combustion Specialists for over a quarter of a century

JOHN ZINK COMPANY

4401 SOUTH PEORIA / TULSA, OKLAHOMA

Representatives in all major cities

PRECISION MEASUREMENT AT ANY FLOW RATE

AMERICAN-WESTCOTT A-88

ORIFICE METERS

Versatile American® Series A-88 mercury-type orifice meters meet the toughest flow measurement requirements – working pressures to 5,000 psi – interchangeable 10, 20, 50, 100 and 200-inch ranges. Recording meters may be equipped with 0-150° F. standard temperature element. Integrating meters integrate static and differential pressure, providing totalized flow indications. Telemetering equipped meters transmit integrated indications to remote locations.

- Manometer body easily cleaned – does not affect calibration.
- Tamper-proof calibration – simple, positive adjustment of float lever arm length.
- Interchangeable ranges – no manifold piping changes.
- Teflon-packed stuffing box is pressure tight, nearly frictionless, never needs lubrication.
- Teflon-packed pulsation dampener externally adjustable under full line pressure.
- Check valves give positive shut-off for over-range protection.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1892)

General Offices: Philadelphia 16, Pa.
Sales offices in principal cities

CRY-O-GEN-ICS

YOUR KEY TO MORE PROFIT

In the petroleum and petrochemical industries, new applications of cryogenics (low temperature separation) are opening the way to more profits.

Interested in low cost production of oxygen, nitrogen, argon, methane? purification or liquefaction of gases? Think *first* of Messer!

Write for *free illustrated brochure.*

Messer

AMERICAN MESSER CORPORATION
Chrysler Building, 405 Lexington Ave.
New York 17, N.Y.

SHOWCASE . . .

New Literature

Portable bulk storage container

. . . for water, liquid, chemicals, diesel fuel, and other petroleum products is discussed in a new eight-page literature piece just made available. Called Fabritank, the collapsible container can be rolled into a 36 by 84 by 30-in. bundle. According to the bulletin, it weighs 1,335 lb. and has a capacity of 17,000 gal. The publication offers photographs, applications, advantages, models available, and specifications. Source: **Firestone International Co., 1200 Firestone Parkway, Akron 17, Ohio.**

Air and gas drilling

. . . compressors and boosters, tools, chemicals, and technical services are described in a newly announced eight-page brochure. Listed are custom fabrication, program planning and supervision, personnel instruction, and other technical services available. The brochure includes a section on foaming agents, drying (anti-balling) chemicals, and their associated pumping units. Source: **Well Completions, Inc., Box 1356, Denver 1, Colo.**

One-man hinged closures

. . . are detailed in revised Bulletin TT956 which contains new design features and extended size ranges. In six pages, the bulletin describes one-weld installation and self-locking-taper safety features while outlining applications for blanking off pipeline ends and tank or vessel openings. Source: **Tube Turns Div., Chemetron Corp., 222 E. Broadway, Louisville 1, Ky.**

Ice-making machine

. . . called "Equity," with a.c. or d.c. electric motor or gasoline-engine drive, complete in one package, is explained in a four-page bulletin now obtainable. It gives photo illustrations, model and capacity charts, and complete specifications. Source: **Equitable Equipment Co., Inc., 410 Camp St., New Orleans 12, La.**

Water-conditioning

. . . data sheet entitled "Slime Control with Chlorine and Nonoxidizing Biocides," has just been made available.

WELL CORROSION?

inhibitor squeeze with

CORBAN

The "squeeze" method of applying Corban®—the Dowell family of corrosion inhibitors—involves pumping the inhibitor through the tubing string into the producing formation. The metal parts contacted by the Corban receive a protective film of inhibitor. As the well is produced, Corban from the formation maintains this protective film for an extended period. "Squeezing" with Corban has been especially beneficial—particularly in wells previously difficult to treat. Get an engineered recommendation from Dowell on the use of Corban.

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

SPEED UP THE FLOW OF PIPELINE FLOW CHARTS WITH CHART-PAK TAPES

Chart-Pak tapes save you hours of drawing drudgery. You don't ink-in or paint lines, bars, shapes and symbols. You tape them on . . . fast . . . with Chart-Pak pressure-sensitive tapes and sheets!

Corrections are easy with Chart-Pak, too. There's no such thing as a mistake you can't fix . . . a change you can't make. If a line or symbol is in the wrong place, you can lift it up and replace where you want it.

DON'T DRAW IT...TAPE IT WITH CHART-PAK

Write for free folder — "Visualization Made Easier."
CHART-PAK, INC., 191 River Road, Leeds, Mass.

Dealers in all principal cities

KOPPERS *ON-THE-SPOT AVAILABILITY OF RINGS KEEPS YOUR LINES "ON STREAM"*

Dependable performance in all oil and gas applications

Koppers Piston Rings are now available in the field in a complete range of materials and a wide selection of types and sizes for every application in the oil and gas industry

For trouble-free performance, lower operating costs, less down-time, select Koppers Piston Rings—choice of many original equipment manufacturers.

Koppers Piston Ring dependability, in even the most rugged applications, is backed with 38 years of experience in manufacturing rings of predictable performance.

If you have a ring problem, consult your Koppers field agent or write: KOPPERS COMPANY, INC., Piston and Sealing Ring Department, 6611 Scott Street, Baltimore 3, Maryland.

Send now for Koppers recommended Piston Ring Set-Ups applicable to the engines which you operate.

KOPPERS

AMERICAN HAMMERED INDUSTRIAL PISTON RINGS

Engineered Products Sold with *Service*

The two-page publication discusses how the judicious use of chlorine and the supplemental use of other biocides will extend cooling-tower life. Source: **Betz Laboratories, Inc., Gillingham and Worth Sts., Philadelphia 24, Pa.**

Clarification, filtration

. . . equipment for wastes treatment is described in new condensed four-page Bulletin SM-1017, just published. It contains illustrations and descriptions of the Oxigritter and Clari-Thickener, two multipurpose treatment units that combine, respectively, grit removal, preaeration and clarification, and thickening and clarification, in single units. Source: **Eimco Corp., Box 300, Salt Lake City 10, Utah.**

Epoxy-insulated motors

. . . Bulletin PB 6000-12 describes motors up to 500 hp., Class B, 60° rise, random-wound in voltages to 600 and form-wound in voltages in 4,160. Detailed illustrations and cutaways of coil slots, stator and rotor laminations, finished coils, the entire wound stator, and the assembled core and flame show how the epoxy insulation completely fills slots and penetrates coils. Source: **Elliott Co., Jeanette, Pa.**

X-ray inspection

. . . of steel castings is outlined in an obtainable technical bulletin. It discusses requirements for various classes of X-ray specifications, the relative extra costs of X-ray inspection, and facilities available. Included is a discussion of different classifications of steel-castings uses requiring X-ray inspection. Source: **Lebanon Steel Foundry, 129 Lehman St., Lebanon, Pa.**

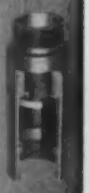
Facts on repairing broken castings

. . . are contained in a newly published 12-page brochure which discusses cold working methods for repairing cracked or broken castings weighing from a few pounds to several tons. The publication illustrates locking and fastening devices that are used in casting repair work. Included are picture studies of actual castings which the company has repaired, such as cylinder heads and manifolds, cylinders and pistons, engine frames, and steam and pressure vessels. Source: **Reynolds-French & Co., 2318 Sand Springs Rd., Tulsa 7, Okla.**

Let R-u-b-b-e-r Take The Wear

in your sucker rod pumps

IT COSTS YOU LESS THAT WAY



● MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

● MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

● The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)

Write for our new 1960 catalog or see it in the new Composite (24th Edition). All products sold thru supply companies.

JOHN N. MARTIN

Manufacturer

9 W. BRADY STREET • TULSA, OKLAHOMA

Noncycling air dryer

. . . known as the F-30 Refrigifilter, is illustrated in Product Bulletin 9100 which gives specifications, a capacity chart, and installation procedure. According to the publication, the unit is designed to protect medium-capacity pneumatic systems from destructive moisture, oil vapors, and other contaminants. It has a rated capacity of 30 s.c.f.m. and combines the functions of a refrigerated condenser, separator, filter, and trap. Source: **Hankison Corp., College and Pike, Canonsburg, Pa.**

Wire-cloth calculator

. . . is now being offered to interested parties. The handy, easy-to-use calculator is designed primarily for engineers and plant personnel who operate equipment which uses woven-wire cloth. The plastic gadget provides a quick means for determining flow rate, pressure drop, particle retention, wire diameter, widths, and types of weaves of filter cloths and some plain, industrial weight, woven screens. Source: **Multi-Metal Wire Cloth Co., Inc., 1350 Garrison Ave., New York 59, N. Y.**

Liquid cyclone

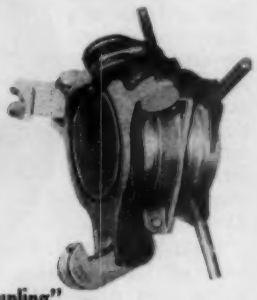
. . . classifiers called DorrClone are featured in eight-page Bulletin 2503. Available in 6, 12, and 24-in. diameters, the models are completely rubber-lined. Applications mentioned include classifying and degritting in chemical processing, and drilling-mud conditioning and water desanding in production work. The literature also includes a description of Siphontrol, an accessory said to maintain a reasonably constant underflow density automatically and without instrumentation over a full range of feed variations. Source: **Dorr-Oliver, Inc., 77 Havemeyer Lane, Stamford, Conn.**

Wall chart

. . . for hydraulic hose is now being offered. Accompanying the 21 by 32-in. two-color chart is a handy 10-page envelope-size leaflet giving highlights of hydraulic hose, couplings, and fittings for replacement use. Included is 24-page Catalog D-1 with supplement covering pressed-on hydraulic hose assemblies and reusable hydraulic hose, couplings, and fittings. It gives specifications and instructions on replacement products for on-the-job installation. Source: **Anchor Coupling Co., Inc., 342 N. Fourth St., Libertyville, Ill.**

New Developments Modernize Your Liquid Handling!

"dripless dripstick" Accurately measures the liquid contents of any container—fast and safely. Mounted top or bottom, this indicator remains hermetically sealed. Just read the extended calibrated rod as it "pops" out of the sealed container.



"QD-16 coupling"

No more bolt and nut connections at dockside, terminals, refineries, or anywhere that heavy hose handling is a time consuming, dangerous operation. Just hook-up and rotate the handle. Sealing and locking are automatic. Can be easily mounted into your present system.

"Just two more reasons why industry looks to FRI for development leadership . . ."

If you have a fluid handling problem (system or component), talk it over with SPECIALISTS. Call or write:

Flight Refueling, Inc.

COMMERCIAL PRODUCTS SECTION

BOX 1701 BALTIMORE 3, MARYLAND

Equipment Men Notes

ACF Industries, Inc. completes

. . . a licensing agreement for the manufacture of valves and fittings in Italy, according to Henry A. Correa, vice president of marketing. Correa said that the company's W-K-M Division would provide designs and technical and engineering assistance to Breda Fucine S.p.A., Milano-based producer of oil-field equipment which will make W-K-M through-conduit gate valves.

30,000-GAL.-CAPACITY CARS of Union Tank Car Co., are the last of 12 such cars to leave the company's Whiting, Ind. plant to be leased to the Baton Rouge refinery of Esso Standard, division of Humble Oil & Refining Co. The cars will be used in transporting ethyl ether. Union first introduced cars of this size last May. They are built to Union's patented "Hot Dog" design which eliminates the conventional underframe and, instead, uses the tank shell itself as a structural member.

Roger S. Loyd will represent

. . . Pittsburgh Steel Co. in the Dallas area as head of a newly opened service office. He will supervise all sales activities of Pittsburgh seamless tubular goods and other company products throughout West and North Texas.

Loyd represented Murray Brooks, Inc., of Lake Charles, La., in the Dallas area from 1954 until joining Pittsburgh Steel. Previously, he was with Continental-Emsco Co. in Dallas.

James Dvoracek is named

J. Dvoracek

. . . midwestern regional manager for Rockwell Mfg. Co.'s Meter & Valve Division, announces Paul C. Kreuch, the division's vice president in charge of sales. Dvoracek, who will headquarter in Tulsa, was formerly assistant southwestern regional manager. Before joining Rockwell in 1956, he was sales manager of Climax Controls Division, Black, Sivalls & Bryson, Inc., for 9 years.

At the same time, Kreuch announced that William F. Gulley has been named assistant regional manager in the western region for the division. He had been San Francisco district manager. Assuming his former post is Nelson E. Davenport.

Gulley joined Rockwell in 1947 as a sales engineer in Los Angeles, was promoted to district manager, Seattle, in 1951, and named to his most recent position in 1955. He will continue to headquarter in San Francisco.

Davenport started with the company as a sales engineer 10 years ago. He became assistant product manager—gas products in 1955, export sales manager for meter and valve products in 1957, and finally, assistant to the vice president of petroleum and industrial sales.

Burgess-Manning Co. promotes

. . . two within its Industrial Silencer Division: William A. Carroll, Jr., from sales manager to manager of marketing; and R. T. Oliver, Jr., from New York district sales manager, to sales manager for domestic operations. H. A. Dietrich, vice president of the division, said that Carroll will coordinate over all sales activities, including a newly established international operation.

W. A. Carroll, Jr.

R. T. Oliver, Jr.

A long-time company employe, Carroll began in the engineering department and later transferred to the sales department. He was formerly district sales manager for the company in New York, and now resides in Dallas.

Oliver, who has been with the company 9 years, has moved to Dallas to the company's general offices. He has held posts as sales correspondent and sales engineer in the Dallas, Chicago, and New York offices.

Pan Geo Atlas Corp. expands

. . . its world-wide services in regard to oil-field logging, perforating, and related services, according to Paul Charrin, president of PGAC. Charrin said that the company now has seven subsidiaries doing business in nine countries.

PGAC's subsidiaries now include: in France and Algeria, PGAC Sahara, S.R.L.; in Germany, Deutsch-Amerikanische Olfelddienst, G.m.b.h.; in Canada, Perforating Guns of Canada, Ltd.; in Venezuela and Bolivia, Servicios Tecnicos Atlas, C.A.; in Argentina, Servicios Tecnicos Atlas, S.A.; in Panama, International Technical Services, S.A.; and in the United States, PGAC Development Co.

Earl M. Fetzer completes

. . . an 8-week program at the University of Pittsburgh's School of Business Administration. The program entitled "Management Problems for Executives," covered facets of the management profession, and was presented to American and foreign business concerns and to administration officers of the government and armed-service groups.

Fetzer has been managing director

accuracy

ASHCROFT DURAGAUGES measure pressure with precise accuracy no matter how severe the conditions of service

Ashcroft Duragauges are available in pressure ranges from 15 psi (or vacuum) minimum to 100,000 psi. Dial sizes: 4½" through 12".

sustained

The Bourdon tube in Ashcroft Duragauges is manufactured to precision standards of flexibility and mono-linked to the rotary movement. When pressure flexes the tube, the gauge pointer is always positively positioned, because it is mounted on the geared center shaft of the movement. Sustained high accuracy and long life are assured.

Choose your Ashcroft Duragauges made of components best suited to your needs. Eight Bourdon tube materials are available. Movement of stainless steel with nylon bearings and pinion gear for longest wear. Case materials: special aluminum alloy or tough phenol plastic.

The unique "Maxisafe®" Duragauge provides absolute protection to the viewer, plus easy and quick access to the mechanism. Your industrial supply distributor will help you select the best combination of components for your Ashcroft Gauge requirements. Phone him today or write for Catalog 300B.

MANNING MAXWELL & MOORE INC. MM&M TRADE MARK

ASHCROFT PRESSURE GAUGES

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

of Continental-Emsco Co., Ltd., since October 1953. He locates in Calgary, Alta.

Bernie Klein joins

Bernie Klein

. . . Advertising Engineers, Inc., of Tulsa, as senior vice president and technical director, according to Leslie Brooks, president of the agency. Klein will serve clients in the Tulsa, Dallas, Fort Worth, and Houston areas.

Wolverine adds C. D. McDowell

. . . to its staff as a heat-transfer specialist in Tulsa, according to G. W. Overstreet, sales manager of the Dallas district for Wolverine Tube Division of Calumet & Hecla, Inc. Formerly with Refinery Engineering Co. for the past 8½ years as sales representative, McDowell will concentrate his activities in the processing industries within Oklahoma, Arkansas, and the northern parts of Texas, Louisiana, Mississippi, and western Tennessee.

Halliburton Co. to expand

. . . activities in the electronic field by transferring ownership, operations, and management of Welex Electronics Corp. to direct parent company control by Halliburton. Thus, Welex Electronics will attain full status as a direct company subsidiary.

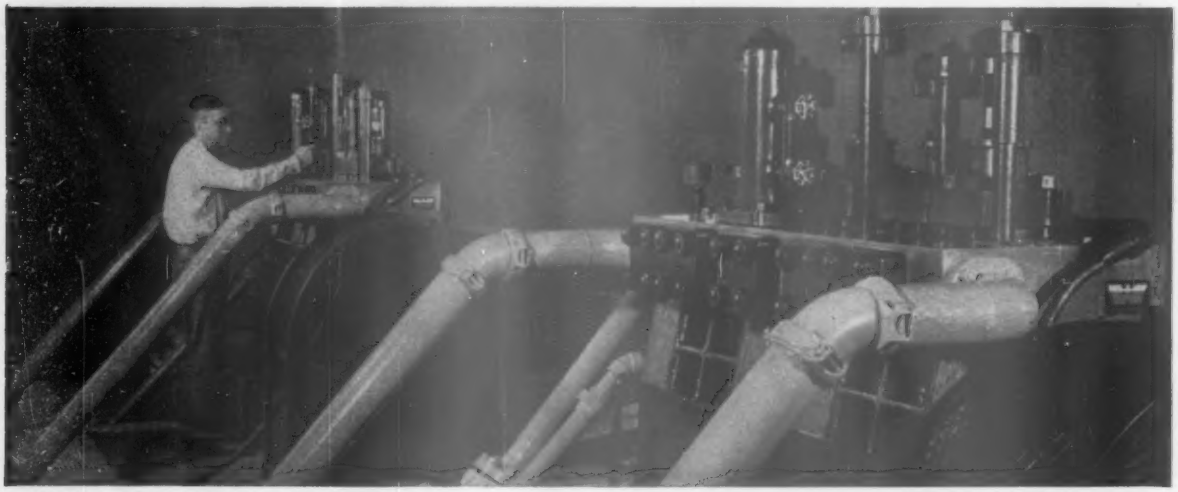
The move was made in preparation for a program of expansion for the electronics firm's operations, facilities, and personnel, to which the full financial and technical assistance of Halliburton will be devoted. Welex Electronics Corp. was formed as a subsidiary of Welex, Inc., in 1959. Welex, Inc., was acquired by Halliburton in 1957.

Roddy Sims Joins A. B. Chance

. . . as sales representative for Chance's Petroleum Equipment Engineering & Services Division. He will headquarter at Houston.

Sims represented other manufacturers for the past 5 years. Previously, he spent 13 years as a design engineer for a pipeline company.

NEW PLANT of E-I-M Co., manufacturer of automation equipment, is located on Pike Road, just north of South Main at Missouri City, Tex. The new quarters, designed to double E-I-M's manufacturing capacity, were constructed at a cost of more than $1,000,000. Accounting, engineering, and executive office space comprises 6,000 sq. ft. The shop section is a metallic steel and concrete structure covering more than an acre of the 10-acre facility.



STOP AND SEE

Stop and see this Blackwell Oil & Gas Company installation at their North Happy Valley Unit, Cushing, Oklahoma. It's two Worthington vertical multiplunger pumps doing a good job of handling salt water disposal . . . currently injecting 5800 and 4500 BPD each.

Since startup in 1957, these two units have put away more than 8½ million barrels of corrosive salt water. Except for routine oil changes, maintenance has been limited to servicing valves and packing an average of once a year.

You say it's not close enough to home to see? Well, we'd still like you to see a Worthington power pump installation—and talk to the operator, too. Because there are so many of these installations, there's bound to be one near you. Just call your nearest Worthington office, listed in the Yellow Pages.

We'll arrange a visit—and you can decide firsthand whether these pumps could do the job you need. A complete line of injection pumps, both horizontal and vertical, from 15 to 3000 horsepower.

WORTHINGTON

*'62 could be the year for you!

YOU WIN BEFORE YOU START...

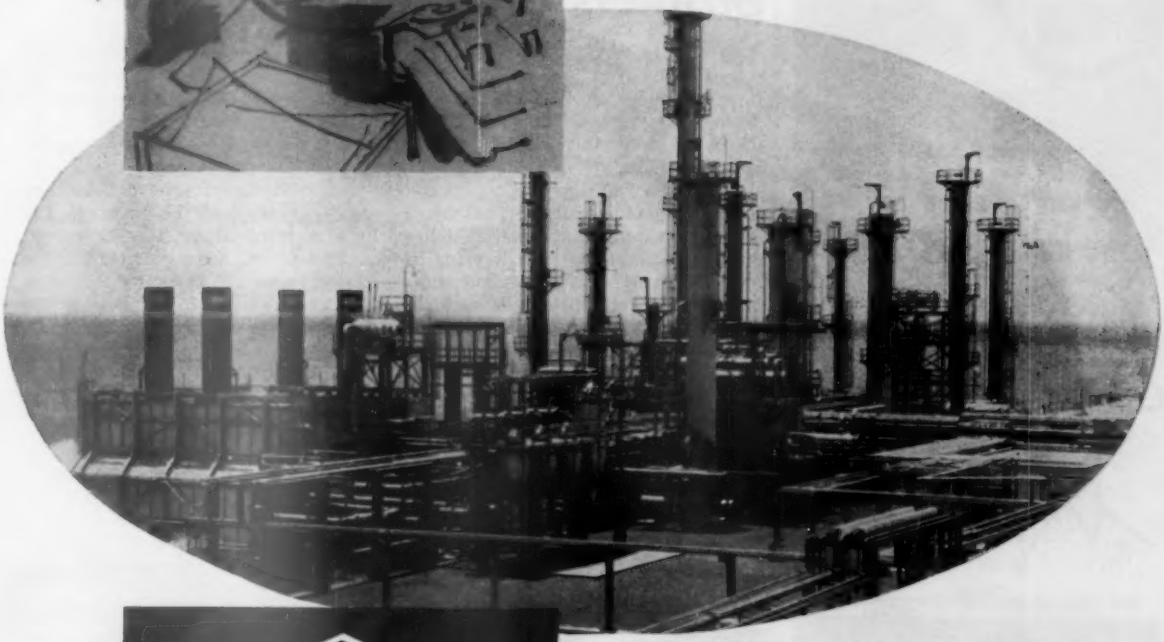
It's a long road from blueprint and flow chart to efficient plant performance. It takes an intimate knowledge of the route to assure safe and timely arrival.

To show where you're headed before you start, Procon presents an accurate picture of what will be provided for every penny invested.

Regardless of where or what the client plans to build . . . petroleum, petrochemical or chemical process facilities . . . Procon prepares a firm proposal covering every detail of construction.

Before planning new construction, consult Procon. It pays . . . in superior construction and assured plant performance.

*A SUBSTANTIAL INCREASE IN PROCESS CAPACITY will be needed by 1962, according to reliable estimates . . . NOW is the time to start your planning!



PROCON®

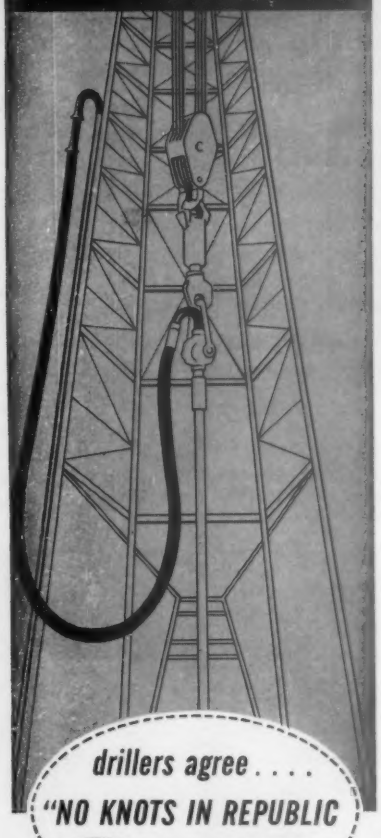
WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM PETROCHEMICAL AND CHEMICAL INDUSTRIES

PROCON *Incorporated*

1111 MT. PROSPECT ROAD, DES PLAINES, ILLINOIS, U.S.A.

PROCON INTERNATIONAL S. A., CHICAGO, ILL., U. S. A.
PROCON (CANADA) LIMITED, TORONTO, CANADA
PROCON (GREAT BRITAIN) LIMITED, LONDON, ENGLAND
PROCON PTY. LIMITED, SYDNEY, AUSTRALIA
PROCOFRANCE S. A. R. L., PARIS, FRANCE
PROCON LIMITADA, SAO PAULO, BRAZIL
VICAPROCON, S. A., CARACAS, VENEZUELA

REPUBLIC
ROTARY
HOSE



drillers agree . . . .
"NO KNOTS IN REPUBLIC HOSE!"

Equal tension on each steel cable prevents knots.

REPUBLIC RUBBER
DIVISION, LEE RUBBER & TIRE CORP.
YOUNGSTOWN 1, OHIO
For information on Rotary, Mud Pump Suction or Vibrator Hose, write to: Republic at Youngstown or check your local J & L Supply Store.

WAR-SURPLUS SEARCHLIGHT is converted from carbon-arc light to incandescent bulb to keep offshore rig safe in fog.

Novel night eye protects offshore rig

A FIRM WAS CONFRONTED with a problem of how to keep ships from crashing into an offshore rig during foggy nights. The solution was found by using this modified 60-in. Sperry antiaircraft searchlight.

The firm, Offshore Co., Baton Rouge, wanted to protect its personnel and equipment aboard a million-dollar drilling platform that was working in the Gulf of Mexico. Danger of ships crashing into the drill site during night fog presented a hazard both psychological and real; it is potentially dangerous to life and expensive to property.

Atop the derrick was mounted this powerful searchlight. The carbon-arc mechanism of the light was replaced with a 10,000-watt, 120-volt incandescent lamp, held in the photo by Roy Duke, Offshore employe.

A ⅓-hp. motor runs a blower to remove heat from the housing. The light is revolved by another motor.

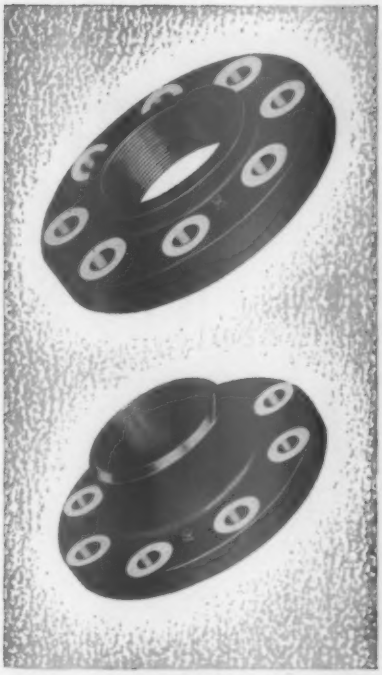
Offshore engineers estimate that the mighty beam will penetrate the dense fogs up to ranges of ½ mile in the dark. This distance is considered adequate to warn off approaching vessels and prevent possibility of ship-platform collisions.

Adaptability could boost success of drilling vessels

SHIPS outfitted as drilling vessels have never been as popular as they might be.

There are a couple in existence which appear suitable for certain areas but the idea has never really caught on. Offshore California chiefly has been the scene of operations for this type of equipment. Last year a drilling ship was considered for Lake Erie, and the drilling vessel La Bosca was reportedly available for lake drilling. At the time the La Bosca was in California waters.

Recently a similar ship, the Rincon, made news. Not because of the type of vessel, but because it was engaged in a successful ocean-floor completion off the northern coast of Peru. This operation was the 3-3 Humboldt, located 6,200 ft. offshore in 132 ft. of water near Cape Blanco. The well



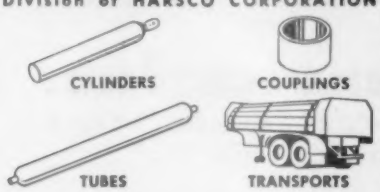
HARRISBURG FLANGES

Harrisburg Drop-Forged Steel Pipe Flanges are made to A.S.A. standards for oil companies, ship builders and pipe fabricators. They come in threaded, butt-welding, slip-on welding, Van Stone and blind types and are shot-blasted and dip-coat finished with a rust preventative black lacquer. Be sure you make it Harrisburg when you want flanges.

More than a Century (H) in Harrisburg 6, Pa.

HARRISBURG STEEL CO.

Division of HARSCO CORPORATION



was drilled and completed by Peruvian Pacific Petroleum Co., a subsidiary of Cities Service Oil Co., in a joint venture with Richfield Oil Corp.

The wellhead of the 3-3 Humboldt is only 12 ft. above the ocean floor, and the well produces to storage tanks onshore through 3-in. aluminum pipe anchored to the ocean floor. The platform commonly used for production is eliminated, reducing a possible hazard to shipping. This procedure may be ideally suited to other areas. In Lake Erie, wells that are completed above the water level could constitute obstacles on the St. Lawrence Waterway which is expected to become busier than ever with shipping traffic. Lake-floor completions could eliminate this problem. Floor completions, though not fully perfected for pumping and workover operations, appear ideal for flowing wells. It appears that more technology is required to overcome the workover and artificial-lift operations before floor completions are more widely used in wells.

The Rincon went to Peru early in 1959 and has drilled 11 test wells so far. The 600-ton vessel is owned by Richfield and is a converted LSM.

The submarine wellhead was built by Shaffer Oil Tool Works Co. of Brea, Calif., out of high-alloy steel. Divers were used to inspect the wellhead installation and pipeline connections at the wellhead, and install the weights on the flow line.

Drilling ships may be ideally suited for some operations. Perhaps in the next few years they will come into their own through increased adaptability.

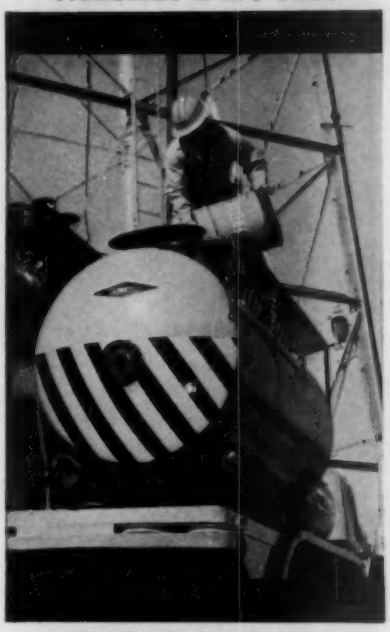
AAODC forms sound-practices group

A COMMITTEE has been appointed by W. L. McClusky, outgoing president of AAODC, to investigate sound practices in the drilling business. Designed to aid the contractors the five-man group was authorized by the directors of AAODC during the September meeting of the organization in New Orleans.

The men tapped by McClusky of M. J. Delaney Co., are: William P. Clements, Southeastern Drilling Co., Dallas, who is chairman; Jack Abernathy, Big Chief Drilling Co., Oklahoma City; R. C. Tucker, Great Western Drilling Co., Midland, Tex.; Mark Gardner, Delta Drilling Co., Dallas; and Max E. Peden, True Drilling Co. of Casper.

The new group will look into unfavorable conditions being forced upon contractors by producers.

WATER BLOCK?



FREFLO

Freflo®—the Dowell product designed to remove water block—acts three ways to help you increase well production. First, Freflo reduces surface tension. Second, it attacks interfacial tension, makes the water and oil more compatible. And third, Freflo breaks emulsions and prevents them from re-forming. Freflo is economical; the 10-gallon steel drum contains enough Freflo for 1000 gallons of treating solution. Available at all Dowell stations.

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

...in difficult areas

On the surface, tellurometers accurate to within inches over a fifty-mile traverse are visible indicators of GSI's new look at refraction shooting.

Looking deeper, recently developed refraction interpretation techniques, special refraction instruments and seismometers are giving GSI clients subsurface data in areas where it was unobtainable in the past.

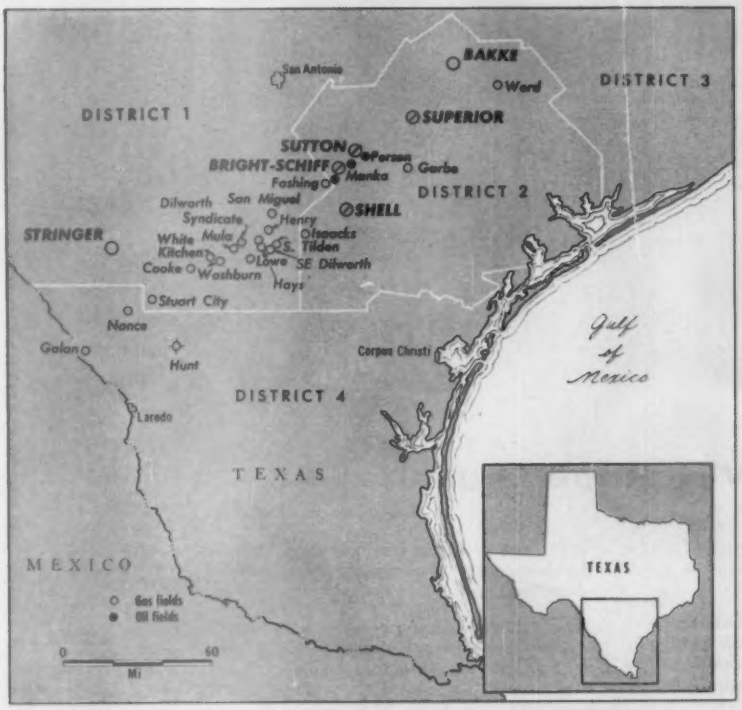
If you have prospects which refuse to yield deep data through the use of reflection shooting our new look at refraction will interest you.

For additional details, write ....

GEOPHYSICAL SERVICE INC.

900 EXCHANGE BANK BLDG. • DALLAS 35, TEXAS

A TEXAS INSTRUMENTS COMPANY



MOST IMPORTANT DEVELOPMENT in South Texas in recent years has been the emergence of the Deep Edwards trend, a 200-mile stretch of pay dirt reaching across 10 counties and 3 Railroad Commission districts. Several remote wildcats are now trying to feel out the areal extent of the reservoir.

Deep South Texas trend bristles with activity

BY FRANK J. GARDNER

TWO DISCOVERY events of the past week have thrust South Texas into the exploration spotlight again. That region's Deep Edwards trend hit a double payoff that once more emphasizes the rewards lurking below 10,000 ft. along a ruler-straight line from the Rio Grande to central Lavaca County . . . a distance of 200 miles.

Two new links . . . Bright & Schiff, independent team from Dallas, has forged a twenty-second link in the Deep Edwards chain with apparently commercial flows of gas and condensate at its 1 Kunkel, in northwestern Karnes County. The discovery lies in Erasmo Seguin Grant A-10 just north of shallow Hobson field, and between Fashing and Panna Maria fields*, both Edwards oil producers.

The 1 Kunkel topped the Edwards-Lower Cretaceous section at 10,765 ft. Two drill-stem tests, one at 10,784-10,802 ft. and another at 10,792-10,842 ft., showed good flowing pressures and pipe recoveries. Operators at last report were drilling ahead to objective depth of 10,892 ft.

Meanwhile, on the northeast end of two-county, two-district Fashing field, Christie, Mitchell, & Mitchell, a Houston independent team, gave the field its second oil well from Edwards lime at 10,881-91 ft. These operators discovered the oil column in late 1959 with their 2 Weddington, a 413-bbl. well at 10,844-59 ft.; prior to that, Fashing had been a prolific gas-condensate field. The new oiler, 3 Weddington, lies 1,500 ft. northeast of the first oil well, in George Elliott Survey A-101. Gravity of the crude in both wells is 34.1°. Potential at the 3 Weddington was 380 bbl. daily on 14/64-in. choke.

In an oil and gas chain . . . Oil wells in this Edwards play are still a scarce commodity, and trend operators are just as happy about the situation.

The nature and extent of these deep reservoirs are still unknown quantities; drilling so far has stuck pretty close to the "straight-line" rule, and except in McMullen County where a trend width of 13 miles has evolved, nobody knows how far updip or downdip the play might go.

That stretches two ways . . . But some interesting wildcats along the trend may begin to reveal the future extent of this important reservoir rock. At least four of them are off the beaten Edwards path. One is J. F. Stringer et al. 1 Taylor et al., a 9,000-ft. contract in east-central Dimmit County. Here's a well that could tell what happens to the Edwards as it mounts the big Chittim anticline, a subsurface arch that plunges coastward through Maverick and Dimmit counties. It lies farther west and north of the trend than almost any wildcat so far aimed at the Edwards.

Another interesting wildcat is Shell Oil Co. 1 O'Neal, first Edwards test in Bee County. This is a 17,500-ft. test on the downdip side of the trend, 3 miles south of Pawnee in the northwestern part of the county. It's the downdip counterpart of Stringer's northwest outpost.

At the northeastern extremity of the Deep Edwards trend, two Gonzales County wildcats will bear watching as they try to fill in the gap between Person field and Word field, northeasternmost outlier on the trend in Lavaca County. Superior Oil Co. 1 Dubose is a 13,600-ft. test 9 miles southeast of Smiley, while W. E. Bakke 1 Steiner, 10 miles northeast of Gonzales, will go to 9,000 ft. (see map).

Other interesting wells along the trend include Sutton Producing Co. 1 Pawelek, a couple of miles northwest of Person field, Karnes County, and the first confirmation test at Isaacks field in Live Oak County—this is Texas Eastern Transmission Corp. 1 Atkinson, a 13,000-ft. contract. There are four rigs busy in Person field itself, two at Fashing, and two at San Miguel. All of which adds up to a most interesting set of pins in this newest bowling alley in the Texas brush land.

*Panna Maria field, just named, is shown on the map as Manka, fee name for Standard Oil Co. of Texas' recent discovery.

Reference

George R. Pinkley, "Edwards Gas Trend of South Texas"; paper delivered at annual meeting, Southwestern Federation of Geological Societies, Abilene, Tex., October 14, 1960. This paper will soon be published in full in The Oil and Gas Journal.

UNION

The *S. O. S. Wire Rope Organization

Service on Schedule

Delayed action on distress signals for wire rope can set up a chain reaction of downtime losses.

With hundreds of selected distributors surrounding a hard core of 15 strategically located and expertly staffed branch offices and warehouses Union is uniquely organized for quick rescue service.

Give this same organization the opportunity and it will cut down the need to send distress signals. How? Through Union's free preventive service. It guides you in the application of the right wire rope. It uncovers faults in equipment and abuses in wire rope operation which cause excessive wear and overloading.

Customers tell us Union's preventive service, coupled with quality so good it makes Union the ultimate low cost rope, is helping substantially to battle against rising operating costs.

Here's how customers have benefited in other ways from Union's years of preventive service. Union engineers sometimes found it impossible to select exactly the right rope from 1600 constructions in day to day production. To correct such a situation in the oil industry, Union engineers, working in the field with rig operators, and Union laboratory technicians developed an entirely new wire rope construction for rotary rig operation. Tailored into Tuffy Rotary line is a balance of strength, toughness and flexibility that has met every challenge including grueling service in drilling the world's deepest oil well.

"Ton-Mile" Engineered **Tuffy** Rotary Lines

Tuffy Standard Rotary Line is "ton-mile" engineered for standard and for large jackknife rotary rigs. **Tuffy Jackknife Rotary Line** is for drilling to depths up to 6,000 feet with the smaller jackknife rigs.

Union Wire Ropes For Well Servicing

For ultimate low-cost servicing ropes Union rod and tube pulling lines, rod hanger line, sand and pump line, cable tool drilling line and winch line.

Helicopters, long noted for their disaster missions, are becoming "work horses" in the air. Equipped with wire rope and slings they pick up and set materials and machinery down in inaccessible places and carry hurry up loads to otherwise easy to get to places. Photo courtesy Bell Helicopter Corporation, Ft. Worth, Texas.

Worldwide Distribution . . . Not far from wherever you produce or seek oil you'll find Tuffy Rotary Line and standard Union Well Servicing Ropes. You get service on schedule and the ultimate low cost wire ropes at leading oil field supply stores.

Ton Mile Indicator

This slide chart provides you a quick, easy method of figuring ton-miles in following the cut-off practice originally developed by Union engineers. Write Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Mo.

Tuffy Wire Rope Tips

Money-Saving Ideas on the Use and Care of Wire Rope

How to Check Groove Diameter

Not Quite

Just Right

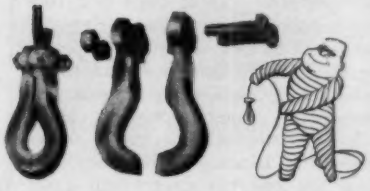
Groove diameter of a sheave or drum must never be less than the actual calipered diameter of the new rope. When a new rope is installed on old equipment, use a reliable groove gauge to make sure the tread or bearing surface of all sheaves is of sufficient size to avoid pinching the rope.

Recommended Sizes

Diameter of Rope	Min. Dia.	Max. Dia.
¼ - ⅞	+ 1/64"	+ 3/64"
15/16 - 1⅜	+ 3/64"	+ 1/16"
1⅜ - 1⅝	+ 3/64"	+ 5/64"
1¾ - 1⅞	+ 1/16"	+ 1/8"
1⅞ - 2¼	+ 5/64"	+ 3/16"
2⅜ and larger	+ 1/8"	+ ¼"

New ropes are usually oversize. It is advisable to have groove diameters of sheaves or drums as large as the actual calipered diameter of the new rope, or slightly larger.

Use the Right Fittings



Right fittings add life expectancy to wire rope. Fittings which derive holding power from crimping action are harmful. Shown here is a clamp that has no "wrong side"—can be put on either way. It snugly saddles the rope, grips larger surfaces in such a way that loads are carried almost entirely by friction instead of crimping action. Combined in its two parts is a thimble. The parts are interlocked to prevent collapse of the thimble, and eliminate all shear on the bolts.

Would you like a copy of a booklet in which more than a score of Tuffy Tips like those above are reproduced. If so, write Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Missouri.

UNION Wire Rope

4-0

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

"Low cost is precisely the reason less-expensive methods are generally neglected. One dislikes to be associated with simple schemes; it is so much more spectacular to be handling staggering sums of money, complicated instruments, and a large contingent of personnel."

These are the words of the author, Amalendu Roy, who is with the Department of Geology and Geophysics at the Indian Institute of Technology, Kharagpur, India. Speaking in defense of the "direct" methods of oil hunting, the author here states his frank opinions regarding the role of geophysics in the world today.

The industry may soon need

A new approach to geophysical method of finding oil

BY AMALENDU ROY

SINCE DRAKE discovered oil in the first well drilled for that purpose 100 years ago, the search for petroleum has been based on either direct oil shows at the surface or location of major structures.

The first possibility exhausted itself soon enough, and a time has now come when, in the countries where the oil industry is a standing business, the second alternative is also fast dwindling.

It is already estimated that in the United States 75% of the oil production is going to be from stratigraphic-type traps in the near future (Levorsen, 1956). Unfortunately there are no standard geophysical methods that can spot stratigraphic traps in a routine fashion, It is true that the gravity meter has located some reef deposits, the reflection seismograph can sometimes detect convergence of beds, and continuous - velocity logging — along with synthetic seismograms — shows promise of locating sand lenses. But these are only in exceptional cases and are by no means regular tools for prospecting for nonstructural traps.

That is not all. Among the purely structural traps also, geophysical methods can reliably locate only a very small fraction of the total available number. Considering the seismic method, for example, which is the best yet (apart from the economics), one can show that:

$$\Delta h/h = \Delta v/(v + \Delta v) \cong \Delta v/v$$

This is a relation connecting the error Δh in depth interpretation for a section of true thickness h due to an error Δv in the velocity v.

Translated into numbers, the above relation means that, even if the velocity data were in error by as little as 1%, the error in depth interpretation in a 3,000-m. section, for example, will be a little less than 30 m. This assumes that everything else in the entire seismic process was working perfectly, in exact compliance with the many simplifying assumptions of both theoretical and practical nature.

To determine the seismic velocities within 1% of the true values is indeed difficult and hardly ever attained in practice. Combine with this the fact that the velocity in any rock type may vary widely, as a glance at any table giving rock velocities will show. For example, according to Jakosky (1940), the longitudinal velocity in alluvium ranges from about 500 to 2,000 m. per second, in sandstone from 2,000 to 4,000 m. per second, and similarly for other rock types. There seems to be no doubt that even in the best of circumstances structures with closures of 30 m. or less fall below the noise level of seismic measurements, and so cannot be reliably located by this method. For basement reliefs in this range, the gravity anomaly can, in rare and most favorable cases, rise up to about 0.3 milligals. For purely sedimentary structural reliefs of this order, the gravity anomaly is unlikely to exceed 0.1 milligals. These, again, are numbers that are, at their best, comparable with the noise amplitudes.

Such structures of comparatively smaller relief must be far more abundant in nature than are the big structures. The basement surface is an erosional surface and by its very nature must be undulating, with smaller features greatly outnumbering the larger ones. Indeed, a really flat basement surface does not exist in nature. What have so far been considered flat are surfaces with reliefs where the vertical and horizontal magnitudes fall below the detection level of our instruments.

The same has to be true for intrasedimentary structures also, because it is unthinkable in geology that a depositional basin is uplifted without horizontal forces coming into play and at a rate that is laterally invariant.

Localized distortion of layers, random in distribution and magnitude, is inevitable. Any by the very statistical nature of the process itself—involving forces and materials over huge areas and intervals of time—it is evident that low-magnitude structures will predominate. What is lost in magnitude is likely to be gained in number.

It is surprising, but logically expected in view of what has been said above, that the Cherokee oil in the U. S. is being produced from anticlines of 5 to 10 m. closure (Goebel and Merriam, 1957).

When one considers the stratigraphic and the low-relief structural traps, it appears that for every oil field discovered there are many others which have not been, because suitable methods of exploration for such cases are not yet available. It may not be far from the truth to say that the oil that has been found and is likely to be found in the future by the present-day techniques is only a small proportion of what may yet be there waiting to be tapped.

Since anything but a continuous rise in the demand for oil cannot be foreseen and since the major structures (which are comparatively few) are already bcoming scarce, it is imperative that methods be developed for successfully tracking the oil con-

cealed in stratigraphic and low-relief traps. It is also imperative that to do this the geophysical methods (or any other method) abandon the all-too-favorite structural basis of exploration. The conclusion seems inescapable that the only methods which will ultimately succeed in locating such oil in a routine manner are those that will look for oil directly.

The idea of developing direct methods for oil exploration is presently scoffed at—especially by the geophysicists themselves—but an examination of facts does not seem to reveal anything basically impossible, even without having to devise a totally new approach. It is not rare in the realm of science that the pattern of contemporary thought has undergone radical changes within short spaces of time. One can cite such examples from the history of the development of the geophysical methods, short as it is.

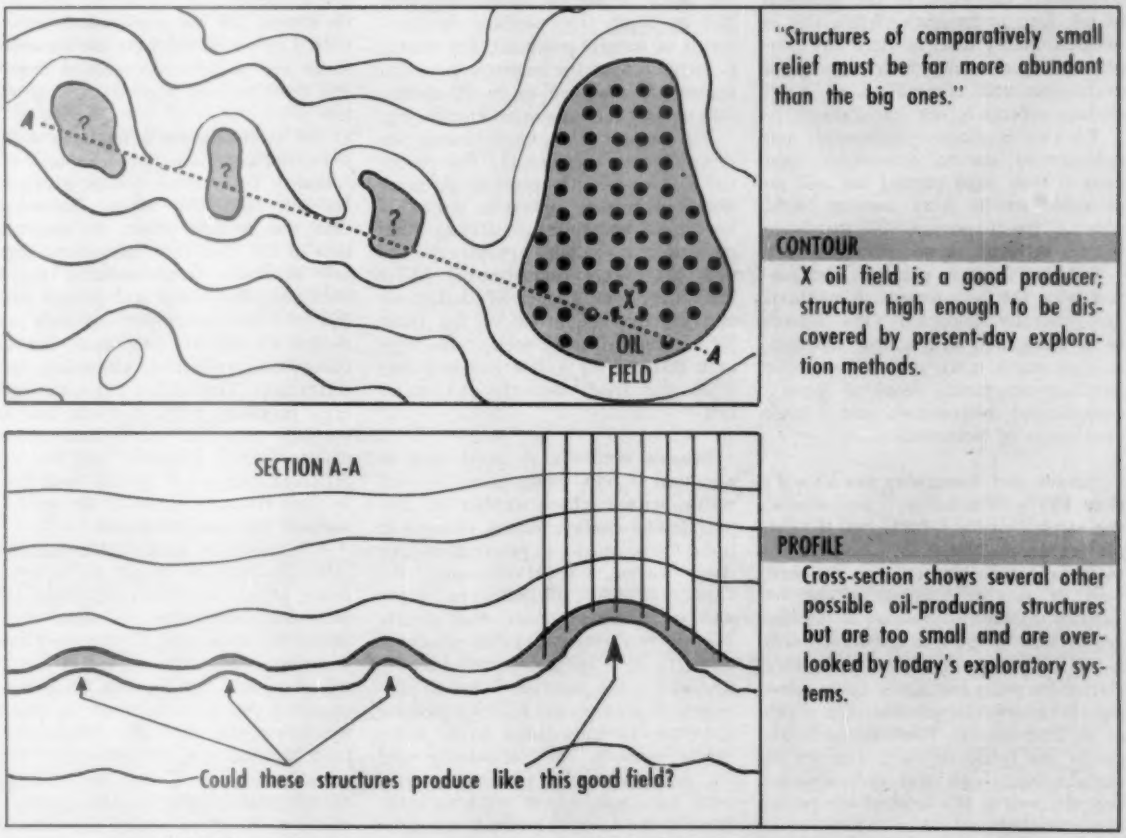
Not more than 12 to 14 years ago, the construction of an airborne gravimeter was classed as one of the impossibles. Yet, already, two types of instruments—one measuring the gravity itself and other measuring the vertical gravity gradients—have been tested with promising results, and it would be no surprise if—in the course of a few years[2]—aeromagnetic surveys are replaced completely by the more versatile aerogravity surveys. A second glaring example is Frank Rieber's Sonograph and related equipment. No one took much notice when these were invented in the early forties. They were certainly clever, but not practical and useful enough. Not much more than a decade after that, exactly the same principles as used by Rieber have become the standard in seismic instrumentation all the world over.

Geochemical prospecting. In taking an inventory of the likely methods for direct detection of oil, one cannot but begin with the geochemical methods. These are based on the indisputable fact that, given enough time, the lighter hydrocarbons from an oil pool will migrate towards the surface of the earth. Just as very competent beds will undergo plastic bending under prolonged action of forces, the most impervious of beds will also allow measurable quantities of hydrocarbons to escape through themselves.

The lighter hydrocarbons, as is well known, can also emanate from other sources near the surface, such as marshy conditions, decaying vegetable matter, existence of peat, lignite, and coal. These possibilities need to be eliminated before a geochemical anomaly can be attributed to the presence of oil. This also makes it necessary to analyze samples not only for methane, but also for the next-higher members. The directness, simplicity, and economy of the method cannot be questioned.

Radioactive method. Even more economical are the gamma-ray measurements, which may sometimes be carried out from air. Radioactive halos over oil fields have been reported and recommended by, among others, no less a pioneer than Dr. H. Lundberg (1952, 1956, etc.). He has also proposed, as a working hypothesis, a simple halo-producing methanism based on the general upward movement of connate water, which originally contains both chlorides and sulfates. While traveling upwards by the edges of the oil fields, the hydrocarbons reduce the sulfates to sulfides.

This is important because chlorides-containing water may dissolve radium and other salts from the rocks in the course of its movement through them, while sulfate-containing water would precipitate it as the insoluble radium


A
?
?
?
X
OIL
FIELD
A
SECTION A-A
Could these structures produce like this good field?
"Structures of comparatively small relief must be far more abundant than the big ones."
CONTOUR
X oil field is a good producer; structure high enough to be discovered by present-day exploration methods.
PROFILE
Cross-section shows several other possible oil-producing structures but are too small and are overlooked by today's exploratory systems.

SMALL but profitable structural or strat-trap fields will be the object of future search.

PENETRATION OF ELECTROMAGNETIC ENERGY INTO THE GROUND

Ground resistivity—	Frequency (c.p.s.)	Depth at which amplitude falls to 19% of primary source at surface (meters)
500 ohm-m. (desert condition, Permafrost?)	500	1,006
	5,000	318
	50,000	101
	*1,500,000	18
50 ohm-m. (alluvial)	500	318
	5,000	101
	50,000	32
	*1,500,000	6
5 ohm-m. (swampy)	500	101
	5,000	32
	50,000	10
	*1,500,000	2

*Wave length = 200 m. The Radoil method claims to be using the 1,600,000-1,700,000-c.p.s. band.

sulfate. On approaching the ground surface, this water, richer in soluble radium salts, meets the oxygen-laden meteoric water which reconverts the sulfides to the insoluble sulfates and causes precipitation.

Here again, one must exercise caution and take due account of the topographic, physiographic, geological, pedological, and hydrological elements of the surface. Objections have been voiced because near-surface variations in the above factors may create halos completely unrelated to the presence of oil deep underneath. While this is unquestionably true, is there any geophysical method in which a complete evaluation and elimination of near-surface effects is not imperative?

These methods (geochemical and radioactive) are so economical that even if they were carried out and no plausible results were coming forth, only a small portion of the huge budget is likely to be spent.

But, low cost is precisely the reason why the less expensive methods are generally neglected. One dislikes to be associated with simple schemes; it is so much more spectacular to be handling staggering sums of money, complicated instruments, and a large contingent of personnel.

Sandex and Longcolog methods (Lee 1957). When a well is available, the sandex method finds out the lateral extension of the oil sand and the most favorable location for the next well. It uses a variation of the resistivity method, familiar in mining geophysics, wherein a known current is fed into the ground by two surface electrodes with extremely large spacing, preferably larger than the depth to be investigated. Potential measurements are made between a series of surface electrodes and one lowered into the well at the level of the petroliferous layer.

Other variations can be devised. Current may be passed between the well electrode and a surface electrode movable along a circle with the bore hole as the center. Circular profiles of potential differences may be plotted for various concentric circles for each position of the surface power electrode. Such methods have logical bases, but are difficult to apply for deeper prospects and require the existence of a well.

Longcolog, on the other hand, is claimed to be far more versatile in that it can locate oil directly and predict its depth from surface measurements of natural potential. The source is attributed to the negative potential commonly observed as an SP deflection against oil beds in an electric log.

The method is unconvincing for three obvious reasons: (1) The potential associated with an oil or gas layer does not become operative until a bore hole containing a drilling fluid of different salinity penetrates the bed; (2) purely water-bearing layers exhibit an even greater SP deflection, and (3) the magnitude of the static SP is too small to be measurable even at a distance of a few hundred feet from the fresh-water-clay-salt water cell.

Seismic methods. A good deal of attention is now being given to such subtle seismic characteristics as amplitude and energy, phases, changes in pulse shape, angle of polarization (for shear waves), etc. However, the chances of direct oil indication by the seismic methods appear slim chiefly due to two reasons. First, whatever property of a seismic record may be studied for the purpose, it has to ultimately depend on the velocity contrast (acoustic impedance, to be more exact) between the oil-bearing and the nonoil-bearing portions of the same bed, which is precious little. Second, the seismic methods are pricing themselves out of all proportions. To illustrate, one may consider the magnetic-tape recording of seismic data. While this has provided a means for obtaining a permanent record over the entire range of usable frequencies, the cost has more than doubled without proportionately increasing the return. To quote Kinney (1956): ". . . the small ones (contract geophysical companies) are wondering whether they can stay in business . .. The large contractors . . . are almost unanimous in saying that they are not making any money on them." Various fancy methods of playback recording like the variable density, variable area, multiple spots, etc., have added a lot of extra expenditure, but practically no advantage. And, of course, the targets are growing smaller all the time.

Electric and electromagnetic methods. A sharp change—of from 200 to 500%—in electrical conductivity exists between the portions of a reservoir containing saline water and oil. It seems logical to assume that, since the most contrastive physical property associated with oil occurrence is electrical conductivity, the electrical and the electromagnetic methods are the ones on which one must direct one's attention. Direct-current electrical methods using several kilometers of separation are used in Russia for oil exploration. However, large separations are cumbersome and galvanic contacts in desert and frost-covered regions are a problem.

The electromagnetic methods using induction and radiation fields are satisfactory from these points of view, but ails from the serious limitation that, due to skin effect, the penetration of the field into the ground rapidly decreases (exponentially) with increasing frequency and ground conductivity (see accompanying table). Added to that are the losses due to geometrical spreading, scattering, and diffraction. This highly attenuated energy produces eddy currents and is partially reflected from boundaries. The secondary magnetic field and the reflected energy are further weakened in their return journey to the ground surface for measurements.

It is, however, conceivable that this difficulty may be sought to be overcome along two lines: (1) Only the induction field (distances small compared to wave length) for very-low low frequencies (about 5 to 200 c.p.s.) may be used. The Russian frequency-sounding method, based on phase measurements, and the magnetotelluric method use this principle. The effectiveness, obviously, lies in being able to make highly precise measurements of the phase angles; (2) whereas each individual signal is negligibly

small, it is possible to think of an arrangement in which the signals from many observations can be integrated or summed, probably by using magnetic recording.

The integration cannot be with respect to time for a given position, because, in that case, noise would increase in the same proportion as the signal. With the integration made with respect to the positions, the random noise for various positions will tend to cancel out while the signals add. Though this kind of a procedure has not been tried yet in electromagnetic prospecting, the idea is not new and has been used in the Geograph (Thumper, or the weight-dropping technique—Waldie 1956).

In the Geograph, seismic waves are generated, not by exploding dynamites, but by dropping a 3-ton mass on the surface of the ground. The impact of a 9-ft. tree fall of this weight is equivalent to the blast of ½ oz. of 60% gelatine dynamite. The energy created by one individual fall, thus, is too small to give a measurable reflection from deep structures. This is, however, amply made up by combining the energy returns from about 40 to 80 drops into one seismic trace.

Where do we go from here? It can be stated without fear of contradiction that if the oil business is to survive, more oil must be found at highly reduced costs. The unpleasant fact is that the present trend is exactly the reverse. Less and less oil is being discovered at progressively mounting costs, in spite of all the pretensions to the contrary. The aim of this discussion is to indicate the theoretical and practical possibility of a much-needed changeover in the right direction. There is promise for a double-fold reduction in expenditure because: the method itself will be considerably more economical, and the number of dry holes are likely to be drastically reduced.

Bibliography

1. Goebel, E. D., and Merriam, D. F., "Trend Players Look to Western Kansas Cherokee": The Oil and Gas Journal, April 1, 1957.
2. Jakosky, J. J., "Exploration Geophysics": Trija Publishing Co., 1940.
3. Kinney, G. T., "Magnetic Recorders Pose Cost Problems": The Oil and Gas Journal, April 16, 1958.
4. Lee, F. W., "Can Oil Be Found by Direct Methods?": The Oil and Gas Journal, April 1, 1947.
5. Levorsen, A. I., "Better Exploration Promises Enough American Oil for U. S.": World Oil, Vol. 142, April 1958.
6. Lundberg, H., "Improved Instruments Stimulate Use of Airborne Radioactivity Surveys": The Oil and Gas Journal, April 1952.
7. "What Causes Low Radiation Intensities Over Oil Fields": The Oil and Gas Journal, April 1956.

Another Ohio wildcat is a producer

ANOTHER WILDCAT is reported as a producer in prospecting for production in northeastern Ohio by Northern Natural Gas Production Co. The latest success, 1 Calvin Clark, Section 1, Windsor Township, Ashtabula County, found the Clinton sand from 3,805-44 ft. with a show of gas natural. Two zones were fractured and shut-in gage was reported as 200 M.c.f.d., 71-hour rock pressure, 1,209 psi.

• Natol Corp. has finaled a good well in a play developing west of Spring Mountain in Monroe Township, Coshocton County. The 1 Catherine Denham, Lot 26, had a natural gage of 1,610 M.c.f.d. with a showing of oil in the Clinton sand from 3,367-3,407 ft. It was fractured with 450 bbl. of water-22,500 lb. of sand and flowed 200 bbl. of oil in a 16-hour test. Rock pressure was reported as 950 psi. Gas was not gaged.

Gas pool discovered in Humboldt Bay area

A new pool discovery has been registered by Zephyr Oil Co., Long Beach, in the fourth well it has drilled in the Humboldt Bay area of northern California.

The operator completed the Leon Oro Blanco T-4 as a deeper pool discovery. The test, located in 35-4n-2w, flowed at the rate of 1,600 M.c.f.d. through a ¼-in. choke from perforations at 3,700-20 ft.

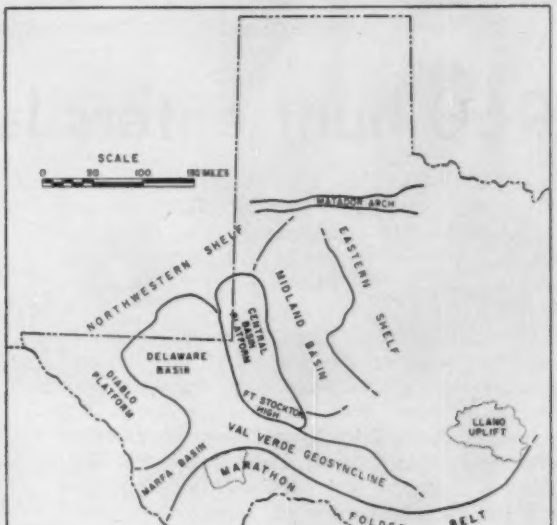
The T-4 is 1½ miles northwest of the T-3, which produces from 2,090-2,110 ft. The T-3, completed in mid-August, flowed at a rate of 1,400 M.c.f.d. through a ⅜-in. choke.

Alaskan stepout completed

PRODUCTION has been extended ½ mile south in Swanson River field on Alaska's Kenai Peninsula by another well completed by Standard Oil Co. of California and Richfield Oil Corp.

The well, 12-9 Soldotna Creek unit, has been completed flowing. No production figure has been announced. The 12-9 is located in SW NW Section 9, which is ½ mile south of the 14-4, previously the most southerly well in the field.

Two other wells are drilling in Soldotna Creek unit and a rotary is being rigged to drill a third. To the north in Swanson River unit, one well is being completed and another is drilling.



THIS MAP, showing major late Paleozoic structural elements of West Texas and Southeast New Mexico, appears in "Aspects of the Geology of Texas: A Symposium," published by the University of Texas. Papers contained in this volume were presented at the University of Texas October 31, 1958, in a conference on "Aspects of the Geology of Texas." The conference was a part of the observance of the seventy-fifth year for the University of Texas and was sponsored jointly by the Bureau of Economic Geology and the Department of Geology. A variety of subjects appears in the volume—from Pennsylvanian reef patterns in West Central Texas, to the Paleozoic history of the Fort Stockton-Del Rio region, from which the above map was taken.

WHEN THE BOOKS ARE CLOSED, Lisbon will remain the exploratory highlight of the year.

1960 hunt enters last-ditch phase

AT THIS TIME of the year there has always in the past been an upward turn in drilling activities as companies begin to clear the books before tax time. Despite the low level of drilling this year, the customary upswing in drilling will begin before December.

With this upswing, though it won't be as high as in past years, certain wildcatting areas around the nation will get a bigger battering than even earlier in the year. With winter and a new drilling year on the immediate skyline, look for extensive interest and exploration in South Texas, Far West Texas and Southeast New Mexico, Mississippi, East Texas and the inland salt-dome empire, Oklahoma's Kingfisher Manning trend and Arkoma basin province, the Lisbon anticline of Utah and Colorado, and Wyoming's Green River and Wind River basins. Two planned tests in Georgia will bear watching in the coming months.

THE YEAR'S BIG DISCOVERY IS LISBON. When the records are in and the stories written, Utah's Lisbon anticline will get the year's top billing as discovery for 1960. Although the Lisbon area was tapped late in 1959, its real growth and importance wasn't fully realized until this year. This long anticline which stretches northwest-southeast through the northern Paradox basin from San Juan County, Utah, into San Miguel County, Colorado, may well be the next Aneth for the Rockies. Half a dozen wells at both ends of the long structure have found production in Devonian, Mississippian, and Pennsylvanian. All of the wells have been prolific gas, oil, and gas-condensate strikes. Drilling is at its peak at both Lisbon and Southeast Lisbon. The area's development will likely be the highlight of next year's exploration tale.

SOUTH TEXAS' LOPENA TREND WILL COME INTO ITS OWN. With the expected outlet for gas from the deep, rich Wilcox fields of Southwest Texas now becoming a reality, look for extensive Wilcox sand development along the Lopena trend of Zapata, Starr, and Webb counties this winter. The new line when finished will have a daily output of 100 M.M.c.f. This Wilcox play isn't new, but the extent of the trend and the prolific reserves that lie waiting, make outlet facilities a must for South Texas development.

OKLAHOMA EXPLORATION CONTINUES BRISK. The famed Kingfisher County Manning

Daylight Flights

on Delta DC-7's between New Orleans and

CARACAS $173.60
Montego Bay $95.40
HAVANA $62.20
tourist fares from New Orleans

Choose Deluxe or Tourist Service

Royal Service features complimentary champagne and beverages, fabulous full-course meals, extra stewardesses, fast baggage handling, much more. Meals are complimentary on Tourist Service, beverages available.

See your Travel Agent or call

DELTA
the air line with the BIG JETS

Delta Jets serve
NEW YORK · CHICAGO
ATLANTA · MIAMI
DETROIT
DALLAS/FT. WORTH
MEMPHIS · HOUSTON
NEW ORLEANS
PHILADELPHIA
WASHINGTON/
BALTIMORE
ST. LOUIS · TAMPA

Killing blow! It takes only minutes for fire to burn your business to a crisp. Guard against the danger of a crippling flammable-liquid fire (as in the spray booth above) with a *fully automatic* Kidde carbon dioxide extinguishing system. Approved by U.L. and F.M., Kidde systems smother flammable-liquid and electrical fires in seconds, leave no mess, turn off power and sound alarms... get you back in production fast. Kidde's 35 years of experience can help you protect any hazard. Write Kidde today and find out how.

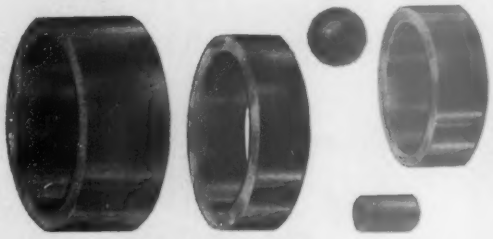
Kidde

Industrial and Marine Division
Walter Kidde & Company, Inc.
1154 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal — Toronto — Vancouver

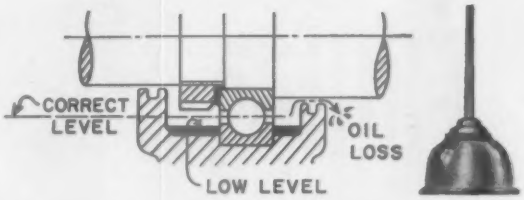
DISTRIBUTOR DAN, the SKF bearing man, tells

WHY BEARINGS BECOME OVERHEATED

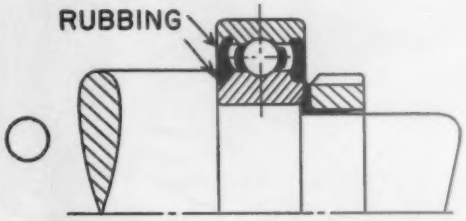
and how to correct the conditions that cause excessive heat.



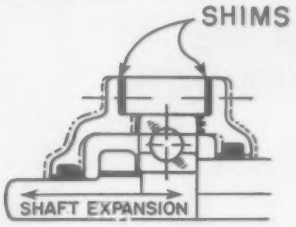
LOOK FOR THIS SYMPTOM. Discoloration of a bearing's rings, balls or rollers is a sure sign of overheating. The color is usually a gun-metal blue or bluish black.



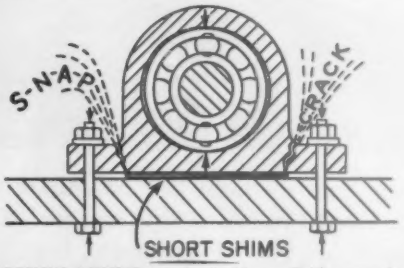
IMPROPER LUBRICATION OR LUBRICANT accounts for most cases of overheating. In pillow blocks, if oil is specified, fill only to the center of the lowest ball or roller in the bearing. If it's grease, the lower half of the pillow block should be filled. Therefore, be sure you're using the right lubricant—in the proper quantity.



RUBBING is a frequent culprit. Check the running clearance of the bearing seal. If it rubs against the shaft shoulder, re-machine the shoulder, to allow proper clearance. Bent lock-washer prongs are sometimes to blame. Straighten them or replace the washer.



EXTERNAL HEAT, conducted through the shaft, can make an inner ring expand excessively. It's usually the result of using a bearing with inadequate internal clearance. Make sure the replacement bearing is exactly the same as the original bearing. Should the markings be indistinct, consult an **Authorized SKF Distributor.**



THE BEARING HOUSING may be to blame—if it's warped or if the bore is distorted and out-of-round. Check to see whether the bore is pinching the bearing and relieve by scraping the bore. Make sure, too, that the pedestal surface is flat and that any shims cover the entire base area.

Baffled by a bearing problem? Whether it's selection, mounting, or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

Spherical, Cylindrical, Ball, Tyson Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

and Meramec Mississippian trend is now spreading northwestward into Garfield County. Coming weeks will see fields along the trend filling in and connecting up to make this one of the nation's most attractive new oil targets.

Other Oklahoma targets will be the Arkoma basin and Ouachita Mountains . . . both of which have deep wells going now with more planned.

WINTER WON'T SLOW WYOMING DOWN. Outside of Lisbon, the leading area in the Rockies is still Wyoming. Focal point of most drilling interest is at Arch in Sweetwater County, leading Almond Mesaverde area in the Green River basin.

There are definite signs in the wind of a drilling pickup in East Texas' inland salt-dome arena. Coupled with this salt-dome play will be a further reckoning of the Jurassic as a prime target in the East Texas embayment.

BIG OIL IS BEING TAPPED IN DELAWARE. The Far West Texas and Southeast New Mexico oil domain is enjoying one of its most important drilling years to date. Pennsylvanian discoveries on both sides of the border in the Delaware basin plus the rapid and successful extension of the Abo trend are brightening prospects for the entire Permian basin kingdom.

WATCH THE SOUTHEASTERN STATES! Mississippi, Georgia, and Florida all will figure highly in this winter's exploration race. The Tuscaloosa of Amite, Pike, and Franklin counties will keep Mississippi operators busy. Humble Oil & Refining Co.'s two Georgia wildcats will get front-page space when drilling begins soon, as will an offshore wildcat in Florida's Keys area to be put down by The California Co.

—John C. McCaslin.

Texas Coast's Clam Lake adds two new pools

Two more reservoirs have been opened for production in the multipay Clam Lake field, Jefferson County, Upper Texas Gulf Coast.

The reservoirs are in Shell Oil Co.'s 43 McFaddin Trust, dually completed with its two pays perforated at 5,816-29 ft. and 5,008-18 ft.

The deeper pay flowed 97 bbl. of 34°-gravity oil daily through 7/64-in. choke with pressure of 1,125 psi., and gas-oil ratio of 1,392 cu. ft. per barrel.

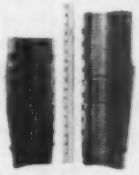
The shallower pay made 99 bbl. of 31°-gravity oil daily, also through 7/64-in. choke. Flowing pressure was 625 psi., and gas-oil ratio 440 cu. ft. per barrel.

Clam Lake is 15 miles west of Sabine Pass and just inshore from the Gulf of Mexico. It was discovered in 1937, and has 25 wells, all productive from Miocene sand, ranging in depth to 6,600 ft.

Utah's Lisbon area gets new outpost well

A big outpost well in Utah's Lisbon area was completed flowing 1,288 bbl. of 54°-gravity oil per day plus 2,863 M.c.f.d. from Mississippian perforations at 8,550-8,610 and 8,620-72 ft. The well is Pubco Petroleum Co. 1 Federal in SE SW 12-30s-24e, San Juan County.

This new well is about 2 miles southeast of Pure Oil Co.'s Lisbon



KelCo's Standard and Long Dies Give More Pipe Contact

KELCO

POWER CASING SLIPS

Famous KelCo features make these air-operated casing slips a necessity for safe, efficient pipe running. Slips are raised and lowered by dual air cylinders. Protects casing, saves time, makes you money. For 4½" through 7" casing.

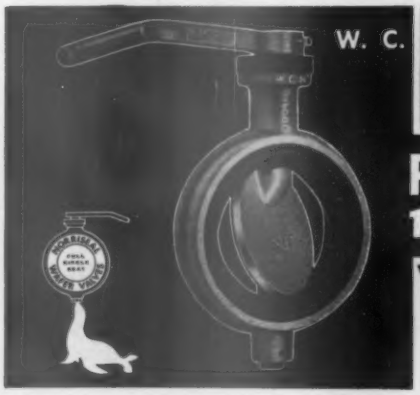
Available Through Your Preferred Supply Store

Write For Free Catalog And Price List

Catheads
Power Slips
Tubing Tongs

KELCO

BEN F. KELLEY CO., INC.
18 South Madison
TULSA, OKLAHOMA



W. C. NORRIS

Field Tested and Approved
150 psi working pressure

WRITE FOR NEW VALVE BULLETIN
P. O. Box 1739, Tulsa

VALVES

field discovery well, a McCracken Devonian producer. An Elliot Production Co. producer 1 mile west of the discovery was completing for flowing oil production from Mississippian. A Belco well 1½ miles southwest has also been completed recently from two oil zones in the Mississippian.

East Kentucky gets good gas well

A GOOD WELL for Big Sandy gas field has been recorded as United Fuel Gas Co. completes 8814 G. C. Bevins for 8,500,000 cu. ft. of gas daily. Located 2,050 ft. from north line and 10,125 ft. from west line of N-86 Pike County, test topped Mississippian Big lime at 2,108 ft., Berea sand at 2,828 ft., and Devonian black shale at 2,935 to 3,600 ft., total depth. Gas was encountered from 3,560 to 3,600 ft. A 48-hour rock pressure indicated 495 psi.

New Strawn oil field opened in New Mexico

Dual Strawn and Bone Spring production is reported at a wildcat in southwestern Lea County, Southeast New Mexico, about 49 miles west of Hobbs. El Paso Natural Gas Co. 1 Lusk deep unit, 19-19s-32e, ½ mile northeast of Lusk Delaware field, flowed at the daily rate of 732 bbl. on potential through ¼-in. choke from Strawn at 11,168-93 ft. From Bone Spring at 8,759-77 ft. it flowed 5 bbl. per hour on ¼-in. choke.

Oklahoma's Kingfisher trend established in Garfield

A Garfield County wildcat has firmly established Oklahoma's Kingfisher County Meramec Mississippian trend in that county to the north. Marion Oil Co. 1 Valtr "A," C SW SW 30-20n-5w, 1½ miles northeast of East Hennessey field, flowed 920 bbl. of 39.6°-gravity oil per day on 20/64-in. choke from open hole at 6,438-6,526 ft.

Oklahoma structure maps available

STRUCTURE MAPS in two parts covering portions of the Ouachita Mountains and Arkoma basin geological provinces in eastern Oklahoma may be of interest to operators planning programs there.

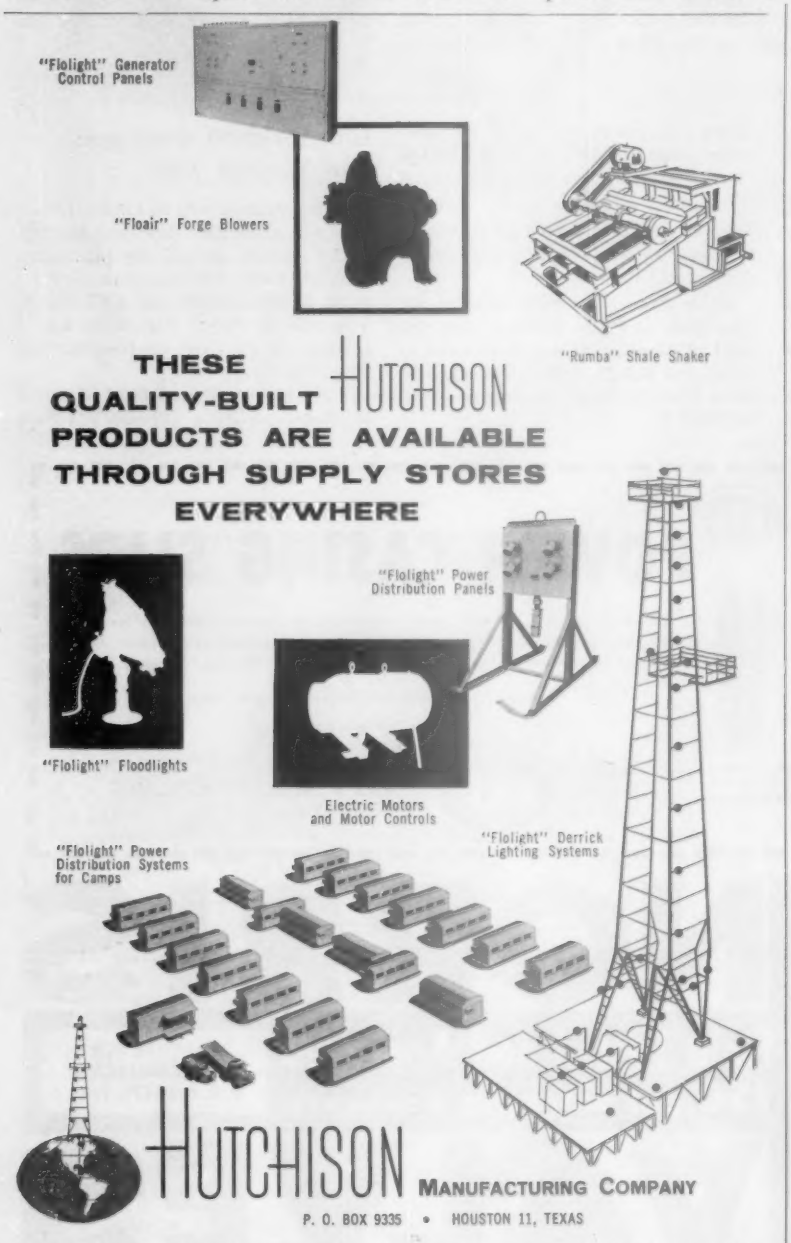
Areas included are from townships 2n to 13n, ranges 13e to 27e. Both maps are contoured on the top of the Pennsylvanian - Hartshorne sandstone with data compiled from logs and scout tickets. Interval of contour is 100 ft. and scale of maps is 1 in. to 1 mile. Displayed are structural trends, existing production, dry tests, and post-Pennsylvanian fault patterns on blue-line prints. Maps were made by R. P. Wilkinson Map Co., 623 Frensley Street, Ardmore, Okla.

First production comes to New Mexico's Chama basin

A small gas producer brought first production to the small Chama basin in northern New Mexico. Discovery well is Great American Oil Co. 1 Sargent in SE SW 4-1s-2e, Rio Arriba County. It flowed 500 M.c.f.d. from perforations at 902-947 ft. The second well in the area, 2 Sargent in SW SE 33-1s-2e, is drilling at 834 ft. Location is about 15 miles south of Colorado's Chromo field.

Louisiana adds gas-condensate well

A RICH gas-condensate discovery in North Louisiana's Jackson Parish gives this parish its first field with liquid hydrocarbon production.


"Flolight" Generator Control Panels
"Floair" Forge Blowers
"Rumba" Shale Shaker
THESE QUALITY-BUILT HUTCHISON PRODUCTS ARE AVAILABLE THROUGH SUPPLY STORES EVERYWHERE
"Flolight" Power Distribution Panels
"Flolight" Floodlights
Electric Motors and Motor Controls
"Flolight" Derrick Lighting Systems
"Flolight" Power Distribution Systems for Camps
HUTCHISON MANUFACTURING COMPANY
P. O. BOX 9335 • HOUSTON 11, TEXAS
A SUBSIDIARY OF REVERE ELECTRIC MANUFACTURING CO.

The parish's two other known fields, one a new discovery, are productive of dry gas.

The new gas-condensate discovery is by Texas Gas Exploration Co. at its 1 T. L. Scarborough, 2 miles west of Cartwright in the northeast corner of the parish.

Production is from the Cotton Valley-Cadeville sand at 9,842-54 ft. Flow through 10/64-in. choke was gaged at 2,040 M.c.f. of gas and 537 bbl. of 54°-gravity condensate per day. Flowing pressure was 4,550 psi.

Location is 5½ miles southwest of the deep multi-pay Calhoun field, in Ouachita Parish. Cotton Valley is among the productive horizons there. This is the nearest production except for a newly completed dry-gas well about 2 miles southeast.

The latter well, drilled by Tom Cook, Jr., is productive from the Rodessa-Hill sand at 5,161½-68 ft. It is one of the parish's two known dry-gas fields. The other, at Chatham, is 12 miles southeast of the new condensate discovery.

Two new Pennsylvanian wells in Nebraska's Barger

Barger field in Redwillow County, Nebraska, has two more Pennsylvanian producers. M. P. Gilbert completed 2 Stevens in C SE SW 6-4n-30w, pumping 61 bbl. of oil daily from Lansing-Kansas City at 3,769-3,815 ft. The 4 Barger in C SE SE 6-4n-30w, completed pumping 36 bbl. of oil and 6 bbl. of water per day from Lansing-Kansas City perforations at 3,833-38 ft.

Deep West Texas wildcat flows Devonian condensate

A scheduled 12,200-ft. wildcat in Winkler County, 9 miles south of Kermit, Tex., flowed 4,250 M.c.f.d. from Devonian at 9,751-9,826 ft. through 18/64-in. choke. The indicated discovery is Skelly Oil Co. 171 S. M. Halley in Section 17, Block b-11, PSL Survey, 1 mile west of Devonian oil in Halley field.

The well also flowed 8 bbl. of condensate in 2 hours and 58 minutes. It is the northwest offset to the 167 Halley, a recently completed Ellenburger and Waddell discovery well.

New book now available from Abilene Society

The stratigraphic distribution of hydrocarbon production from 12 counties in the Abilene area of Texas is the subject of a new book by the Abilene Geological Society, Box 974.

This volume is the latest publication of the society. It will be of interest and use to not only geologists, but to the oil producer, the contractor, the banker, and to anyone interested in the oil and gas business in the Abilene area.

This study portrays the stratigraphic distribution of the more important oil and gas fields of the Abilene area in Callahan, Coke, Coleman, Fisher, Haskell, Jones, Nolan, Runnels, Shackelford, Stonewall, Taylor, and Throckmorton counties, Texas. The fields included in the study have produced 50,000 bbl. of oil or more, have five or more wells, or are considered significant fields. An index map of each county portraying the producing fields is included with a series of county maps showing the producing levels designated by system or series boundaries, as follows: Cambro-Ordovician, Mississippian, Bend, Strawn, Canyon, Cisco, and Wolfcamp. That portion of the field producing from each level is shown in solid black within the field outline.

Dual completion made at Central Oklahoma wildcat

A wildcat discovery well in Cleveland County, Central Oklahoma, was

pumps continuously...
800 bbls/day every day
at 1300 psi

Model KCA Triplex Reciprocating pump, made by the Worthington Corp., Harrison, N. J.

WISCONSIN-POWERED
salt water pump

MODEL VG4D
4-cylinder —
25 to 37 hp

Once started, this Worthington salt water disposal pump becomes an automaton. It works 24 hours a day, every day. To keep up the pace, the pump is powered by a heavy-duty air-cooled Wisconsin Engine that is tailored for the grueling job.

The rugged VG4D Wisconsin is built to stand up under continuous loads. It is precision-fitted to cut wear and upkeep. Its high torque enables the engine to slug through shock loads without stalling.

The air-cooled Wisconsin starts fast and runs smoothly in freezing cold and broiling heat. And you don't have to bother with water or anti-freeze — nor with radiators, water pumps, fan belts, and other water-cooling parts.

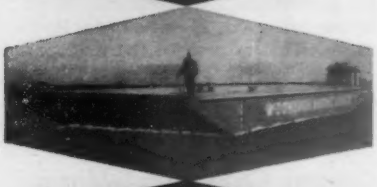
For the most power service with the least care, specify Wisconsin Engines on your utility units. Get Bulletin S-249 covering all Wisconsin Engines — 3 to 56 hp.

WISCONSIN MOTOR
CORPORATION
Milwaukee 46, Wisconsin

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
2420 McKINNEY AVENUE • HOUSTON, TEXAS
608 SOUTH MAIN STREET • WICHITA, KANSAS
Oil Field Distributors for Wisconsin Engines and all types of Utility Units

World's Largest Builders of Heavy-Duty Air-Cooled Engines J-211

STEEL BARGES
for Charter



FOR
OIL FIELD
SERVICE

Mc Donough
Marine Service
429 BALTER BLDG.
New Orleans 12, La.
Phone: Magnolia 6824

completed from second Wilcox and Oil Creek Ordovician sands. The well is Herman Brown 1 Kunkler in SW SW SW 24-9n-1w, 1½ miles northeast of East Falls field.

Potential of the second Wilcox was 195 bbl. of 36°-gravity oil daily through 12/64-in. choke from perforations at 6,748-58 ft. The Oil Creek made 240 bbl. of 36°-gravity oil daily from perforations at 7,419-30 ft. through 10/64-in. choke.

Triple completion. Booming Kingfisher County picked up a prolific triple producer at Hall-Jones Oil Corp. 1 Kudlac in East Hennessey field, C SW SE 15-19n-6w.

The well flowed 222 bbl. of oil daily from Red Fork Pennsylvanian at 6,361-6,420 ft. through ¼-in. choke. From Manning Mississippian at 6,538-48 ft. it flowed 660 bbl. per day through ¼-in. choke. And from Mississippian at 6,760-95 ft., open hole, it flowed 120 bbl. per day through ¼-in. choke.

Lisbon area well flows oil from Mississippian

Standard Oil of California gaged 23.3 bbl. of oil per hour on a drill-stem test at 8,368-8,472 ft. at the 21-15 Arnold in NE NW 15-30s-24e, San Juan County, Utah.

Initial gas flow was 3,677 M.c.f.d., upping to 4 M.M.c.f.d. Other tests also had gas flows. This series of tests is believed to be in Mississippian. Top of the salt was at 4,348 ft. Standard is now running logs at 8,523 ft. Location is 1 mile south of Lisbon field's Devonian discovery well and ½ mile east of recently opened Mississippian production.

Ignacio. To the southeast in the San Juan basin, El Paso Natural Gas Products Co. gaged 22,398 M.c.f.d. through 2½-in. line at the 14-20 Ignacio 33-7 in SE NW 20-33n-7w, Ignacio-Blanco field, La Plata County, southwestern Colorado.

Flow was from the Dakota Cretaceous at 7,738-7,820 ft. Location is 1 mile south of the 4-17 Ignacio-33-7 well, completed last year flowing 8,120 M.c.f.d. through ¾-in. choke against a line pressure of 600 psi. This well was considered to be one of the best in the basin when it blew out at 62 M.M.c.f.d. through casing. Production is also from Dakota at 7,382-7,588 ft.

Ordovician wildcat to go down in South Dakota

An 8,400-ft. Ordovician Red River wildcat is slated for the extreme northwestern corner of South Dakota.

Signal Drilling & Exploration Co. will drill 1 State in SE 36-23n-2e, Harding County. Location is 8 miles southeast of Little Missouri field in Bowman County, North Dakota, a Red River producer in NW SW 9-129n-106w. Red River also produces 12 miles southeast of Signal's well at South Dakota's Buffalo field. Nearest drilling is 1½ miles southwest at an old Stanolind wildcat in C NE NE 11-22n-2e, the 1 Clark-USA unit.

Montana. Tests are under way at Murphy Corp.'s big Devonian discovery at 1 Sletvold in C SE SE 18-30n-48e, Roosevelt County.

The Nisku has been perforated at

NEW
WAX
SOLVENT!

PARABAN!

Dissolves paraffin in tanks, flow lines, lead lines, tubing and annulus.
From Mud Control Laboratories comes a wax solvent that surpasses hot oil treatment . . . and costs far less! Actual field tests conducted without benefit of heat, proved Paraban to be faster acting than any competitive solvent tried.
CONTAINS NO HALOGEN CHEMICALS . . .
Paraban is a mixture of hydrocarbon fractions chosen for their high solvency for waxy constituents in crude oil. Paraban contains no chlorin or arsenic.

For further information Call or Write
MUD CONTROL LABORATORIES INCORPORATED
P.O. BOX 1315 • OKLAHOMA CITY

GOVERNMENT SALE

SEALED BID OPENING—DECEMBER 6, 1960

14.70 ACRES OF LAND

PORTION OF RAILROAD SPUR,
DYESS AIR FORCE BASE, NEAR ABILENE, TEXAS

Bids are invited for the purchase of three 75 foot wide parcels of land containing a total of 14.70 acres, including mineral rights, located at the northwest corner of Dyess Air Force Base, near Abilene, Texas. The land was acquired for a railroad spur track, which served the Airfield. The railroad trackage previously located on the land is not included in this sale and has been removed. Active wells nearby indicate the possibility of oil and gas deposits being present under the land offered.

HOW, WHEN AND WHERE TO BUY

All bids must be submitted on "Invitation, Bid, and Acceptance Form No. GSA-R-374," which describes the property, states the terms and conditions of the sale and necessary instructions.

Sealed bids will be received at GSA Business Service Center, Room 101, 1114 Commerce Street, Dallas, Texas, until 1:00 P.M., CST, December 6, 1960, at which place and time they will be publicly opened and read.

FOR THE INVITATION, BID, AND ACCEPTANCE FORM, write or call GSA Business Service Center, 1114 Commerce Street, Dallas 2, Texas. Further information can be obtained from the office listed below or call RIverside 8-5611, Extension 2131.

GENERAL SERVICES ADMINISTRATION
PULIC BUILDING SERVICE
ACQUISITION & DISPOSAL DIVISION
1114 COMMERCE STREET
DALLAS 2, TEXAS

GS-1244

SECONDARY RECOVERY

PETROLEUM ENGINEERS
STEPHENS ENGINEERING
WICHITA FALLS, TEXAS

RESERVOIR ENGINEERING
Water Flooding Gas Repressuring
EVALUATION CORE ANALYSIS
SURVEYS ECONOMICS
Cost Estimates, Design, Installation
FIELD SUPERVISION
Phone 723-2167

7,660-76 and 7,686-92 ft. Three drill-stem tests from 7,644 to 7,722 ft. got up to 87 bbl. per hour at 7,664-80 ft. Top of the pay is at 7,651 ft. There were no shows in the Lower Devonian zones.

The first extension to this first important Williston basin discovery of the year is the 1 Zimmerman in C SE SW 17-30n-48e. Surface pipe is set at 614 ft. Placid Oil Co. is rigging up another Devonian test 1½ miles north at 1 Lough in C SE NW 13-30n-47e.

Southern Arkansas adds five new wells

Completion of five additional wells in the neighboring Lick Creek and Sandy Bend fields of Union and Bradley counties in southern Arkansas, is reported by Olin Oil & Gas Corp., New Orleans.

Two of the wells are in Lick Creek field, where production is from Meakin sand at depths averaging 2,550 ft. They raise the total number of Olin's wells in this field to 49, and the daily output to 2,000 bbl.

The new wells, both pumping, are: 1 Fairris-State, 154 bbl. daily; and 2 Fairris-State, 114 bbl. daily. A third well, 3 Alphin, is testing for completion but no gage of production has been taken.

At Sandy Bend, less than 7 miles south of Lick Creek, Olin is a joint operator with Sinclair Oil & Gas Co. The three new completions there boost to 27 the number of producing wells the joint operators now have in the field. Their daily output is 400 bbl.

New wells, also all pumping, are: N-25 Olin Fee, 32 bbl. daily; N-27 Olin Fee, 25 bbl.; and N-28, 37 bbl.

Discovery wells

WESTERN CANADA

Alberta:

Amerada Crown 6-24 CC Gosling, LSD 6, 24-44-6w5. Cardium oil well. TD 7,542 ft.

Cancrude Michigan-Wisconsin 6-16 Vulcan, LSD 6, 16-16-24w4. Basal quartz gas well. TD 6,251 ft.

Hudson's Bay-CPOG 7-31 Wintering Hills, LSD 7, 31-26-19w4. Glauconitic gas well. TD 4,913 ft.

7-36 Wintering Hills, LSD 7, 36-26-19w4. Viking gas well. TD 4,665 ft.

Kewanee 7-13 C. Cessford, LSD 7, 13-26-16w4. Mississippian gas well. TD 4,210 ft.

British Columbia:

Dome-Provo b-2-H Laprise Creek, Unit 2-Zone-4-NTS Map 94-G-8. Triassic gas well. TD 4,391 ft.

COLORADO

Moffat County:

Intex Oil Co. 1-16 Intex Alpha, OTD 3,950 ft. OWDD. SE SE 16-7n-93w. IPF Mesaverde 5,800 M.c.f.d., ¾-in. choke, Frontier 1,800 M.c.f.d., 12/64-

VIKING
POSITIVE DISPLACEMENT
PUMPS
HELP YOU TO:

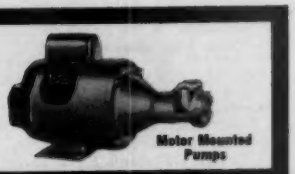
CHOOSE from over 800 catalog models or thousands of special models.

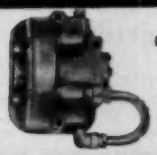
SAVE space on custom built, stripped models or compact standard construction.

SPECIFY exact size and capacity needed—also materials of construction.

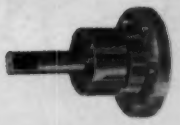
OPERATE pumps in either direction, including reversible operation.

DEVELOP pressures up to 500 lbs. (hydraulic oils), 200 lbs. (heavy duty), 100 lbs. (general purpose).


Motor Mounted Pumps


Custom-built Pumps

Unmounted Pumps


Stripped Pumps

For complete information, ask for catalogs BT, CT and SP-509T
VIKING PUMP COMPANY
Cedar Falls, Iowa, U.S.A. In Canada, it's "ROTO-KING" Pumps
Offices and Distributors in Principal Cities • See Your Classified Telephone Directory

Plunger Life up 600%

The Colmonoy Spraywelder applies powdered nickel-base alloys smoothly and quickly. Overlays are then fused and ground.

Plungers hard surfaced in California machine shop give much longer service, keep oil production costs at a minimum.

COLMONOY HARD SURFACING KEEPS PRODUCTION MOVING

600% longer plunger service life as compared to conventional chrome plating—that's the report of a California machine shop. Application of the hard-surfacing alloy is quick, inexpensive—can be applied repeatedly. Colmonoy No. 6 alloy is ideally suited for resisting abrasion, corrosion, and metal-to-metal wear.

Colmonoy alloys and methods help solve excessive metal wear problems, cut production costs. Write for the Spraywelder Catalog and the Hard-Surfacing Manual today.

HARD-SURFACING & BRAZING ALLOYS
WALL COLMONOY CORPORATION
19345 JOHN R STREET • DETROIT 3, MICHIGAN
Buffalo • Chicago • Houston • Los Angeles • Morrisville • New York • Pittsburgh • Montreal • London, England

in. choke. Mesaverde 3,695-3,750 ft., Frontier 8,598-8,630 ft. TD 9,828 ft. New field discovery.

NEBRASKA

Banner County:

Pan American 1 State-O, C SE NE 36-18n-57w. IPP 100 BOPD, and 54% water, "J" sand 6,770-76 ft. TD 6,890 ft. "J" sand discovery, new field.

NORTH LOUISIANA

Jackson Parish:

Texas Gas Exploration Co. et al. 1 T. L. Scarborough, 18-17n-1w, 2 miles west of Cartwright. IP 2,040 M.c.f.d., 537 BCPD, 10/64-in., 54°, TP 4,550 psi., perf. 9,842-54 ft., Cotton Valley-Cadeville sand. TD 10,508 ft. New-field discovery—first liquid-hydrocarbon production in parish.

SOUTH LOUISIANA

Assumption Parish:

Union Texas Natural Gas Corp. 2 State Lease 3,426, 24-13s-12e, in Lake Verrett. IP 3,100 M.c.f.d., 28 BOPD, 11/64-in., 47°, TP 4,700 psi., perf. 13,950-80 ft. TD 14,523 ft. Second well and new-pay discovery in Pierre Pass field.

Lafourche Parish:

Sohio Petroleum Co. 1 Rathborne, 26-14s-17e. Shut-in gas-condensate well, no gage, perf. 12,407-17 ft. TD 13,538 ft. New-field discovery 3½ miles north of Melodia field.

St. Mary Parish:

Quintana Petroleum Co. 1 Maryland Land Co. unit, 19-15s-10e. IP 346 BOPD, 9/64-in., 29.6°, GOR 838 cu. ft. per bbl., TP 2,400 psi., perf. 14,195-14,201 ft. TD 14,320 ft. New pay in Garden City field.

NEW MEXICO

Chaves County:

C. D. Turner 2 Childress, 3 miles northeast of Roswell in 18-10s-25e. IPP 34 BOPD, 30 BW, 27°, San Andres 682-692 and 702-710 ft. TD 775 ft. New oil discovery.

Lea County:

Tennessee Gas Transmission Co. 1 State-Monsanto, 25 miles west of Hobbs in 16-25s-32e. IP swab 70 BO and 19 BW, 41°, Delaware sand 4,644-79 ft. TD 4,771 ft. PBTD 4,740 ft. New oil discovery.

San Juan County:

Delhi-Taylor Oil Co. 1 McCulley, NE SW 14-28n-9w. IPF 4,918 M.c.f.d., ¾-in. choke, SITP 1,879 psi. SICP 1,881 psi. Dakota 6,672-6,856 ft. TD 6,910 ft. Dakota discovery, new pool.

Johnston & Shear 1-5 Westheimer-Neustatd, SW NE 5-31n-13w. IPF 2,518 M.c.f.d., ¾-in. choke, SITP 1,690 psi. Graneros-Dakota 6,698-6,774 ft. Dakota discovery, new pool. TD 6,857 ft.

OHIO

Ashtabula County:

Northern Natural Production Co. 1 Calvin Clark Sec. 1, Windsor Twp., Clinton 3,805-44 ft. IP 200 M.c.f.d. Rock pressure 1,209 psi. TD 3,967 ft. New gas discovery.

EAST TEXAS

Hunt County:

Paul C. Teas 1 J. H. Chambliss, Mary Latham Sur., A-597, 4 miles northeast of Quinlan. Open-flow potential (calculated) 23 M.M.c.f.d., 32 BC per M.M.c.f., 61.6°, shut-in TP 2,937 psi., perf. 8,987-98 ft., Smackover. TD 9,100 ft. New Jurassic field.

NORTH TEXAS

Wasoff-Brown Oil Co. 1 C. S. Jacobs, 13 miles northeast of Jacksboro in H. Martin Sur. A-383. IPF 159 BOPD, 16/64-in. choke, TP 140 psi., CP 570 psi., 41°, GOR 600:1. 5,548-56 ft. TD 5,725 ft. New oil discovery.

SOUTHWEST TEXAS

LaSalle County:

Sutton Production Co. 1-A C. N. Cooke, J. M. Rodriguez Sur., A-639, 12 miles southeast of Cotulla. AOF 11,800 M.c.f.d., dry gas, shut-in TP 1,582 psi., perf. 3,884-88 ft., Wilcox. TD 10,402 ft. New pay in Cooke field.

McMullen County:

Blair-Vreeland 2-B D. W. Rhode, L. E. H. Spaulding Sur., Section 86, 21 miles southwest of George West. AOF 14 M.M.c.f.d., GLR 34 M.c.f. per bbl., 60.3°, shut-in TP 2,375 psi., perf. 7,500-5 ft., Wilcox-Slick sand. TD 8,003 ft. Discovery well of Southwest Rhode Ranch (proposed) field.

Starr County:

Tennessee Gas Transmission Co. 3-C Slick-State, Section 893, D. Kirtland Sur., A-935, 10 miles west of McCook. AOF 6,100 M.c.f.d., GLR 30 M.c.f. per bbl., 58,3°, shut-in TP 4,396 psi., perf. 9,480-9,500 ft., lower Vicksburg. TD 10,015 ft. New reservoir discovery in Borosa area.

Coastal States Gas Producing Co. 1 Canuta A. Montalvo, Tract 5, Share 9, La Sal Colorado Grant, 2 miles northeast of Santa Elena. AOF 6,800 M.c.f.d., GLR 107 M.c.f. per bbl., 53.4°, shut-in TP 3,615 psi., perf. 6,434-44 ft., Frio. TD 6,704 ft. New-reservoir discovery in North Sun area.

CSI

Practical ideas for BETTER Cathodic Protection

HOW YOU SAVE MONEY BY USING "HIGH POTENTIAL" RATHER THAN "STANDARD" MAGNESIUM ANODES

Why do you use magnesium anodes to stop corrosion of pipe lines, tank bottoms, oil well casing, etc.—rather than other types of galvanic anodes that sell for less money per pound?

The answer is, of course, because magnesium gives you a lower overall cost for cathodic protection. Magnesium's higher potential (approximately 0.4 volts) makes it possible to achieve protection with fewer installations.

If the above is true, then it follows that a "high potential" magnesium anode (delivering approximately 0.3 volts more than regular magnesium) can give you an even lower overall cost. This would be especially true if there is no sacrifice in useful ampere hours of current per pound.

Galvomag, the high-potential magnesium anode developed by The Dow Chemical Company, meets both of these requirements: It delivers 20 to 35 per cent more current than standard H-1 alloy magnesium anodes; and it has a current efficiency (ampere hour rating) comparable to H-1 anodes. Other so-called "high potential" and "high current" anodes tested however, do not show current efficiencies in a comparable range.

To help you get the most for your magnesium anode dollar, we suggest that you specify Galvomag or its equivalent in solution potential and ampere hour rating.

CSI engineers—pioneers in cathodic protection—have also developed a wide variety of special sizes and shapes to make Galvomag even more efficient. For example, the use of these special sizes in "hot spot" protection of pipe lines makes it possible to lower the number of anodes required by one-third—without decreasing the amount of protection or shortening the life of the installation.

It will pay you to check with CSI—for expert engineering and installation services, plus a complete line of cathodic protection supplies for both rectifier and anode installations. Prices are competitive. Call or write today.

CSI

Cleveland 13, Ohio
1309 Washington Ave.
Tel. CHerry 1-7795

CORROSION SERVICES INCORPORATED
General Office: Tulsa, Okla.
Mailing Address:
Box 787, Sand Springs, Okla.
Tel. Circle 5-1351

TEXAS GULF COAST

Bee County:

Johnie L. West 1 A M. Seger et al., George O'Docharty Sur., A-49, 6 miles southwest of Beeville. AOF 5,808 M.c.f.d., dry-gas, shut-in pressure 1,121 psi., perf 2,822-32 ft. Frio. TD 2,925 ft. Old hole drilled in 1948 to 4,316 ft. Extension and new pay in Yougeen area.

Brazoria County:

General Crude Oil Co. 2 Houston Farms, Lot 6, Block 8, Perry & Austin Sur., A-110, 6 miles southeast of Chocolate Bayou. IP 424.26 BOPD, 12/64-in., 39.8°, GOR 1,332 cu. ft. per bbl., TP 3,250 psi., perf. 12,598-12,610 ft., Frio. TD 13,441 ft. Discovery well of South Chocolate Bayou field.

Goliad County:

Carrl Oil Co. 2 John Burns Estate, G. Cortinas Sur., A-82, 8 miles northeast of Berclair. AOF 12 M.M.c.f.d., dry gas, shut-in TP 1,058 psi., perf 2,703-10 ft., Frio, and 5,700 M.c.f.d., dry gas, 788 psi., perf. 1,882-84 ft., Frio. TD 4,077 ft. New pays in Clip field.

Jackson County:

H. H. Howell et al., 1 Rose & Sample, Section 2, Hahl Subd., Harwood Burns Ranches, John J. Linn Sur., A-213, AOF 17 M.M.c.f.d., GLR 87 M.c.f. per bbl., 54.6°, shut-in TP 2,580 psi., perf. 6,686-90 ft., Frio. TD 6,701 ft. New pay in El Toro field.

Texkan Oil Co. 2 R. M. Allnoch, H. W. Munson Sur., A-57, 7 miles north of Lolita. AOF 17 M.M.c.f.d., GLR 86.58 M.c.f. per bbl., 61.6°, shut-in pressure 2,233 psi., perf 6,298-6,302 ft., Frio. TD 7,305 ft. New-field discovery.

W. R. Johnston Trust 1 I. F. Spence, A. B. Williams Sur., A-270, 7 miles north of Ganado. AOF 25,900 M.c.f.d., dry gas, shut-in TP 1,166 psi., perf. 2,763-68 ft., Miocene. TD 3,776 ft. New reservoir and extension discovery in East Cordele area.

Jefferson County:

Shell Oil Co. 43 McFaddin Trust, S. A. Pace Sur. 2, 15 miles west of Sabine Pass. IP 97 BOPD, 7/64-in., 34°, GOR 1,392 cu. ft. per bbl., TP 1,125 psi., perf., 5,816-29 ft., Miocene, and 99 BOPD, 7/64-in., 31°, GOR 440 cu. ft. per bbl., 850 psi., perf. 5,008-18 ft., Miocene. TD 6,515 ft. New pays in Clam Lake field.

Karnes County:

Standard Oil Co. of Texas 1 Luch Manka-Gdn-2, Andres Hernandez Grant, A-4, 2 miles east of Hobson. IP 98 BOPD (net), 15% water, 18/64-in., 46°, GOR 11.22 M.c.f. per bbl., TP 595 psi., perf. 10,918-34 ft. and 10,934-47 ft., upper Edwards. TD 11,450 ft. New-field discovery 5 miles southwest of Person Edwards field.

Matagorda County:

Texkan Oil Co. 1 W. A. Elder et al., H. Yeamans Sur., A-416, 5½ miles north of Palacios. AOF 9,200 M.c.f.d., GLR 19 M.c.f. per bbl., 56.7°, perf. 9,294-98 ft., Frio, and 15,200 M.c.f.d., GLR 21 M.c.f. per bbl., 57°, perf. 9,205-9 ft., Frio. TD 9,365 ft. Discovery well of Elder field—2 miles northeast of Southwest Pheasant field.

Humble Oil & Refining Co. 1 J. C. Lewis, Lot 46, C. G. Cox Sur., A-18, 3 miles south of Buckeye. IP 295 BOPD, ⅛-in., 46.5°, GOR 3,125 cu. ft. per bbl., TP 5,250 psi., perf. 10,662-70 ft., Frio; and 316 BOPD, ⅛-in., 47°, GOR 3,063 cu. ft. per bbl., TP 5,325 psi., perf, 10,612-20 ft., Frio. TD 11,709 ft. Discovery well of Duncan Slough field.

Newton County:

Oil Reserves Corp. 1 J. D. Miller, Adam L. Stewart Sur., 3 miles northeast of Bon Wier. IP 226.67 BOPD, 11/64-in., 46.5°, GOR 2,200 cu. ft. per bbl., TP 1,600 psi., perf. 10,126-32 ft., Wilcox. TD 11,400 ft. Extends Quicksand Creek field 1 mile west.

Orange County:

Texaco Inc. 26-B W. H. StarkMary A. E. Hall Sur. 1, A-403. AOF 7,200 M.c.f.d., GLR 249 M.c.f. per bbl., 54.3°, shut-in TP 659 psi., perf. 7,699-7,794 ft. (over-all), Hackberry. TD 8,050 ft. New pay in Port Neches field.

Refugio County:

T-C Oil Co. 3-G Dennis O'Connor et al. Power & Hewitson Sur., A-53, 7 miles northeast of Refugio. AOF 80 M.M.c.f.d., dry gas, shut-in TP 1,795 psi., perf. 4,482-90 ft., Frio. TD 6,050 ft. New pay in West Lake Pasture field.

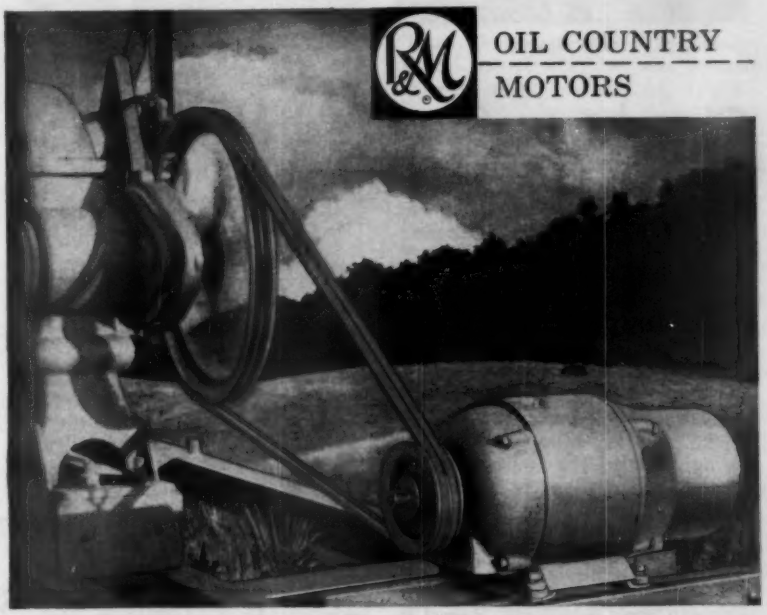
San Patricio County:

Cosden Petroleum Corp. and Dillard & Waltermire Drilling Co. 1 T. A. McKamey, Lot 5, Gregory Farm Block "F" of Coleman-Fulton Pasture Co. Subd., 4 miles northwest of Gregory, AOF 11 M. M. c. f. d., 57 BC per M.M.c.f., 57°, shut-in TP 3,750 psi., Frio, perf. 9,977-92 ft., and 4 M.M.c.f.d., 55 BC per M.M.c.f., 56°, 3,057 psi., perf. 9,460-87 ft., Frio. TD 10,400 ft. New-reservoir discovery east of Midway field.

WYOMING

Crook County:

U. S. Smelting, Refining, & Mining Co. 2-32 Kummerfield, C NE SW 32-51n-68w. IPF 231 BOPD, 13/64-in. choke, TP 600 psi. Dakota 6,093-6,113 ft. TD 6,135 ft. Dakota discovery, new pool.



R&M OIL COUNTRY MOTORS

REMOTE LOCATIONS *need*
Maintenance-Free R&M Motors!

New Robbins & Myers
Single Phase *"All Weather 40" Oil Country Motors*

Ratings up to 20 HP, eliminate maintenance and constant attention when they replace internal combustion engines in remote areas. Motors are fully weatherized against moisture, dirt, heat. Auxiliary mechanism is externally mounted for simple inspection, even while motor is running. For reduced current starting, sizes above 7½ HP (10, 15, 20 HP) have unique *"cushion start"* system available as extra-cost option. Write for Bulletin 470-OG

ROBBINS & MYERS, INC.
MOTOR DIVISION • SPRINGFIELD, OHIO

M. E. Spaght

H. S. M. Burns

Spaght to Succeed Max Burns

ONE of the petroleum industry's outstanding personalities, H. S. M. Burns, will retire at year's end as president of Shell Oil Co., and Monroe E. Spaght has been elected to succeed him.

Spaght, executive vice president of Shell since 1953, has been considered for some time the heir-apparent to the top post in Shell.

Burns, who became president in 1947, has directed Shell operations during a period which has seen the company's annual revenues treble to $1,850,000,000.

Burns is renowned as much for his urbanity and the sparkle of his Scotsman's wit as for his leadership in industry and in his own company. He joined Shell as a geophysicist in California, after being graduated from the University of Aberdeen and receiving his master's degree in mathematics and physics from Cambridge University.

He served Shell in the marketing department for 10 years following his initial assignment, and then in Venezuela and Colombia, where he was general manager. Burns returned to the U. S. in 1946 as a senior vice president of Shell.

He has been a spokesman for the industry, as a chairman of the American Petroleum Institute and as president of the Fourth World Petroleum Congress. He has also been active in civic and cultural affairs.

Spaght's career . . . Spaght came up from the research and manufacturing side. A scholar himself, he has been a leader in scientific and educational fields in addition to his career in the petroleum industry.

He is a director of Stanford Research Institute, the API, and the Institute of International Education. He is a trustee of Stanford University, which has awarded him AB, AM, and PhD degrees.

Spaght joined Shell in 1933 at the Martinez, Calif., refinery, becoming manager of technological activities for Shell manufacturing operations on the West Coast in 1940.

During World War II, he worked on several government technical committees. In 1945, he served on the U. S. naval technical mission to Germany. He was also a director of the U. S. strategic bombing survey in Japan.

Returning to Shell in 1946, Spaght was elected vice president of Shell Development Co., becoming president of that company 3 years later.

Lawrence (Bud) Grames has been appointed chief engineer of Belco Petroleum Corp., New York. **Robert E. McDonald** has been named manager of the company's Big Piney, Wyo., office. He succeeds **Bill Johnston,** who has retired.

Marvin J. Bender, senior exploration geologist for Mobil Oil Co. in New Orleans, has been transferred to Houston as division staff geologist. He succeeds **William W. Gibson,** who has been transferred to New York as staff exploration geologist in the exploration and production department there.

Andrew R. Fish, Phillips Petroleum Co., has been elected president of the Billings, Mont., Geological Society. Other new officers are **Paul H. Shannon,** Continental Oil Co., first vice president; **Robert L. Marsh,** British-American Oil Producing Co., second vice president; **Irvin Kranzler,** Shell Oil Co., secretary; and **Harmon T. Ashmore,** Amerada Petroleum Corp., treasurer. New directors are **Frank A. Swenson,** U. S. Geological Survey, and **Charles G. Maio,** Continental Oil Co.

Arthur B. Brown, Whiting, Ind., senior research associate with Standard Oil Co. (Ind.), has retired after 38 years with the company. In new appointments at the Whiting research laboratories, **William F. Pansing** and **Richard E. Pierson** have been named senior research engineers. New senior project chemical engineers are **Walker H. Bowman, William H. Herring, Jr., John E. Hinman, Theodore W. Stein, Wilbur L. Hayne, Jr., Robert E. Lyon, Donald A. Plautz, Robert J. Toman,** and **Ralph G. Zelmer. Charles B. Tracy** has been named senior project automotive engineer, with **Lee J. Allman** as project automotive engineer. **Arthur C. Borg, Robert R. Cartmell, Joseph B. Corns,** and **George E. Johnston** have been named project chemical engineers.

Thomas H. Sterling, Jr., formerly with Pan American Petroleum Corp. in Liberal, Kans., has joined the First National Bank & Trust Co. of Oklahoma City as petroleum engineer in the oil-loan department.

E. H. Lynch, group supervisor in refinery technical service at California Research Corp.'s El Segundo, Calif., laboratory, has been promoted to supervising research engineer in refinery technical service at the Richmond, Calif., laboratory. **S. G. Miller,** research engineer at El Segundo, has succeeded Lynch there.

A. W. Lang, Jr., Oklahoma City division petroleum engineer for Tennessee Gas & Oil Co., has been named district production superintendent in Hobbs, N. M. **H. W. Swan,** production foreman in Hobbs, has been transferred to Shreveport, La., where he will succeed **M. H. Dunehoo.** Dunehoo has been transferred to Lafayette, La., as production foreman.

▶▶▶ Personals

Robert T. Ellzey, Jr., has joined Monsanto Chemical Co.'s Lion Oil division as geologist in Houston.

Robert G. Hawthorne has been promoted to senior research engineer at Union Oil Co.'s Brea, Calif., research center.

Dr. Allan Weinstein has joined Esso Research & Engineering Co. as a chemist.

J. R. Cunningham, special representative for Continental Oil Co.'s Rocky Mountain region, has retired after 47 years with the company.

RUPF

J. A. Rupf, senior electrical engineer for Magnolia Pipe Line Co. in Dallas, has been elected president of South Saskatchewan Pipe Line Co., Regina, an affiliate. He succeeds **J. S. Black,** recently named manager of Mobil Oil Co.'s West Coast pipelines. South Saskatchewan is partially owned by Mobil Oil of Canada, Ltd. Rupf has been with the Mobil companies since 1935.

J. W. (Jack) Hinckley has been elected vice president of Petroleum Property Management, Inc., new Dallas contract production firm. Hinckley had been with The California Co., Simpson-Fell Co., Stekoll Petroleum Corp., Humble Oil & Refining Co.'s Carter division, and had been a consultant before joining Petroleum Property.

H. F. Tomfohrde, Jr., New York transportation manager for Tidewater Oil Co., has been given complete responsibility for the company's transportation department following retirement of **Harrison B. Haney,** vice president, transportation. Tomfohrde has been with Tidewater since 1929.

Fred Siefke, division supervisor in chemical products in the Bayonne, N. J., refinery of Humble Oil & Refining Co., has been promoted to head of the chemical-products division, manufacturing department. He succeeds **Fred Moulton,** who has been named additives coordinator in Esso Export Corp.'s chemical department. **Vic Tebbutt,** head of the economics and budget division at Bayonne, will succeed Siefke in chemical products. Tebbutt will be replaced by **Wayne Seltzer,** head of the chemical-technical service division. **Harry Hazelhurst,** coordinator, will succeed Seltzer.

Robert E. Maples, assistant superintendent for Continental Oil Co. in Baltimore, has been transferred to Ponca City, Okla., as process engineer.

Aubrey Earl Swift, production engineer with Humble Oil & Refining Co., has been transferred to Midland, Tex., from Houston.

Dr. Chris A. Stiegman, director of research for Hooker Chemical Corp., and **Charles C. Hornbostel,** director of finance, have been elected vice presidents. Stiegman will continue to headquarter in Niagara Falls, N. Y., and Hornbostel will continue in New York City.

David Haun, petroleum engineer with Shell Oil Co. of Canada, Ltd., has been appointed personal assistant to the president. He succeeds **J. G. Stout,** who has been named Calgary area stratigrapher.

Don E. Lawson, Forest Oil Corp., has been elected president of the Wyoming Geological Society. Serving with him will be **Glen L. Faulkner,** Superior Oil Co., first vice president; **Ben Weichman,** Lion Oil division of Monsanto Chemical Co., second vice president; **Leonard A. Toucher,** Richfield Oil Corp., secretary; and **John H. Larson,** Signal Oil & Gas Co., treasurer.

J. Byron Eckert will become regional executive for Mobil International Oil Co. for North Africa, France, and Spain effective December 1. He will succeed **Arthur G. Reed,** retiring after 34 years' service. Eckert joined Mobil in 1948, became general manager of the Mobil affiliate in Syria in 1954, and in 1958 was made general manager of Mobil affiliates in both Syria and Egypt. He has been in New York since early this year as regional executive for marketing and manufacturing in the Middle East.

Russ Haag has been appointed research coordinator of the technical department at the Bayway refinery of Humble Oil & Refining Co.'s Esso Standard division, Linden, N. J. Haag had been executive secretary of Esso Standard's manufacturing-technical committee in New York. **Jack McKenna,** head of the manufacturing department's planning section, has been named head of the petroleum technical-service division at Bayway. McKenna succeeds **Bill Wehner,** who has been transferred to the supply department in New York.

E. C. Hurd, vice president of Trans Mountain Oil Pipe Line Co., has been elected president and a director of Trans Mountain and its subsidiaries. He succeeds **D. M. Morrison,** who has retired after 5 years as president. **R. P. Ritchie,** vice president of transportation and supplies for Shell Oil Co. of Canada, Ltd., has been elected a director of Trans Mountain. He succeeds **D. B. Vale,** Shell vice president. Hurd joined Trans Mountain in 1953 as manager of oil movements. He was refinery superintendent for Mercury Oil Refining Co., Oklahoma City, before that time, and had also been refinery manager for British American Oil Co., Ltd., and Cooperative Refinery Association, Kansas City. He had been a vice president of Trans Mountain since 1948. Ritchie is also a director of Trans-Northern Pipe Line Co., Portland Pipe Line Corp. and Montreal Pipe Line Co., Ltd.

HURD

Realignment of Gulf Oil Corp.'s domestic marketing organization has resulted in new appointments in the Fort Worth and New Orleans marketing division. In Fort Worth, **R. J. Chappell, Jr.,** has been named coordinator of sales; **H. S. Coffman** has been named superintendent of supply and field services; **C. R. Swenson** has been named supervisor of dealer and sales training; and **M. D. Allyn** has been named office-services supervisor. Chappell, Coffman, and Swenson move to Fort Worth from Houston. Chappell had been assistant district manager there. Coffman was division superintendent of supply and distribution, and Swenson was division supervisor of merchandising. Allyn had been on special assignment in New Orleans. In the New Orleans division, **J. S. Dickinson** has been named coordinator of sales. **H. W. Hemstreet** has been named superintendent of supply and field services. **D. T. Ketchum** has been appointed supervisor of dealer and sales training, with **M. L. Rice** as division supervisor of office services. Dickinson was formerly Shreveport, La., district manager. Ketchum moves from Jackson, Miss., where he was district sales manager. Hemstreet had been manager of supply and operations, New Orleans, and Rice was supervisor of market research there.

Personals

G. Wendell Smith, geologist with Mobil since 1942, has been named chief geologist of Mobil International Oil Co.'s producing department. After working as Mobil geologist at San Antonio and Bismarck, N. D., he became representative of Mobil Overseas in Basel, Switzerland, in 1956. A year later he was made exploration manager for Mobil Oil Francaise (now Mobilrex).

T. F. Wingard, assistant manager of Sinclair Pipe Line Co.'s products-movements department, has been promoted to assistant manager, crude-oil movements department. **G. M. Stout,** Mid-Continent chief division dispatcher, has succeeded Wingard. **C. J. Snyder,** Mid-Continent assistant chief division dispatcher, has been named division chief dispatcher, products. All three will headquarter in Independence, Kans.

Richard W. Camp, Oklahoma-Kansas division manager for Arkansas Louisiana Gas Co., has been elected a vice president. Camp is former president of Consolidated Gas Utilities Corp., which was purchased by Arkla earlier this year.

S. Robert Blair, gas-operations engineer for Alberta & Southern Gas Co., Ltd., has been promoted to executive assistant to the vice president and manager of Alberta & Southern and Alberta Natural Gas Co. He succeeds **John G. Smith,** who recently was named to the headquarters staff of Pacific Gas Transmission Co. Blair is also a director of Alberta & Southern.

Wilton H. Gerhardt is manager of Libyan operations for Arabian Bechtel Corp., which has a contract for laying a 100-mile 30-in. pipeline from Zelten oil field to Marsa Brega, on the Mediterranean coast.

Wayne Corley, assistant chief engineer for Interstate Oil Pipe Line Co., has been named general manager of the West Shore Pipe Line Co. construction project. Interstate, part owner of West Shore, will design and supervise construction of the Chicago-to-Green Bay, Wis., products line. Other Interstate men assigned to the West Shore project are **Vernon Cardin,** construction superintendent and assistant to the general manager; **Dee McKinley,** project engineer; and **M. P. Sills** and **Don Cox,** field engineers. **Bill Dennis** will supervise right-of-way acquisition and claims. **Milton Grove,** section head of planning and economics for Interstate, has been named assistant chief engineer, succeeding Corley. **Henry Luckett** will succeed Grove. **Frank Therrell** has been named operations engineer for Interstate, succeeding McKinley. In other Interstate appointments, **Walter McDermon** has been named section head of general engineering, and **Jimmie Powers,** associate engineer, has moved to the Ferriday, La., district from Brookhaven, Miss.

John I. Moore, Jr., head of Skelly Oil Co.'s oil and gas reserves section, has been named manager of the company's new economics department. Moore was senior engineer in production research for Humble Oil & Refining Co. before joining Skelly in 1949.

S. A. Patterson, a vice president in charge of Signal Oil & Gas Co.'s economic-development department, has been named assistant general manager of the manufacturing department. Patterson joined Signal when the company acquired Bankline Oil Co. in July 1959. He was vice president, general manager, and a director of Bankline.

William P. Gee has been elected vice president and assistant to the senior vice president of Texaco Inc., and **M. F. Granville** has been elected vice president and head of the petrochemical department, succeeding Gee.

GEE

GRANVILLE

Granville had been general manager of the petrochemical department in New York. Gee joined Texaco in 1927. He has been vice president of Texaco Development Corp., assistant to the president of Texaco, and president of Texas-U. S. Chemical Co. He became vice president, petrochemicals, last year. Granville was superintendent of the chemicals division at Texaco's Port Arthur, Tex., refinery before becoming general manager of the petrochemical department in 1958. He has been with the company since 1939.

Harold E. Vaughan, assistant to the vice president of Transcontinental Gas Pipe Line Corp., has been elected first president of the new Natural Gas Men of Houston organization. **Quinton S. Drake,** Lion Oil division of Monsanto Chemical Co., has been named honorary president in recognition of his work in helping found the group. (See news section for details.) Other officers are **H. L. McDonald,** Pan American Petroleum Corp., first vice president; **E. Rue Thomas,** Trunkline Gas Co., second vice president; **Lonnie E. Crawford,** Humble Oil & Refining Co., third vice president; **Jack Gale,** Transcontinental Gas Pipe Line Corp., secretary; and **E. H. Fenner,** Shell Oil Co., treasurer. Directors are **C. R. Worst,** Natural Gas Pipeline Co. of America; **T. C. Beavis,** Tidewater Oil Co.; **Joe Tamasey,** Tennessee Gas Transmission Co.; **W. D. Yale,** Texaco Inc.; **J. D. Mayhall,** Superior Oil Co.; **J. W. Mims,** Phillips Petroleum Co.; **Allan Hamill,** Claud B. Hamill Co., and Drake.

VAUGHAN

H. A. (Hobe) Martin, manager of Mobil Oil Co.'s Denver marketing district, has retired after 31 years with the company. He will be succeeded by **William F. Baker,** formerly Cleveland marketing manager.

Marlin P. Nelson, senior chemical engineer in Sun Oil Co.'s advanced management and methods division, has been appointed assistant director of the division. Nelson joined Sun in 1948 as a technical-service engineer.

Paul B. Greig, Jr., has been named division geologist for Texas Gas Exploration Foreign C.A., subsidiary of Texas Gas Exploration Corp. He will headquarter in Calgary. Greig was with Husky Oil Co., Ltd., as geologist and administrative assistant to the vice president in Calgary before joining Texas Gas.

Leslie M. Cassidy, former chairman of the board and president of Johns-Manville Corp., and **Joseph H. King,** partner in Eastman Dillon, Union Securities & Co., have been named directors of Olin Oil & Gas Co. Cassidy now is a director and consultant to Johns-Manville and a trustee of the University of Pennsylvania. King is a director and executive committee member of American Express Co. and a director of Colorado Oil & Gas Corp.

Hartley Powell, geologist with Pure Oil Co., has been transferred to Casper, Wyo., from Ardmore, Okla.

John R. (Bob) Lathrop, district geologist for A. A. Cameron Oil in Oklahoma City, has been transferred to Sacramento, Calif., as geologist.

T. (Dick) Davis, division superintendent for Whitehall Oil Co., has been transferred to Andrews, Tex., from Bridgeport, Tex.

William W. Walmsley, assistant Rocky Mountain division manager for Sun Oil Co., has been promoted to division manager. He succeeds **Philip S. Justice,** who has been named special assistant to **John G. Pew,** Sun's

WALMSLEY

JUSTICE

senior vice president in charge of production. Walmsley joined Sun in 1951. He had been Rocky Mountain assistant manager since 1956. Justice will undertake a series of comparative studies on Sun's undeveloped oil properties. He has been with the company since 1920.

John E. Swearingen, president of Standard Oil Co. (Ind.), has been elected a director of the National Industrial Conference Board. He will serve a one-year term.

E. K. Lucas has been named chief geologist for Fain-Porter Drilling Corp., Oklahoma City. Lucas was with Gulf Oil Corp. before joining Fain-Porter in 1958.

W. C. Miller, exploitation engineer in Shell Oil Co.'s Pacific Coast area, has been transferred to Houston as reservoir engineer. **E. D. Yetman,** mechanical engineer, New Orleans, and **L. P. Johnston,** mechanical engineer in Lafayette, La., have been transferred to Houston.

M. J. Condon, general manager of Burmah Oil Co. (Pakistan Trading) Ltd., and chairman of Pakistan Petroleum, Ltd., and Sui Gas Transmission Co., Ltd., has left Pakistan to take charge of Burmah Oil Co. interests in India. His new headquarters are in New Delhi. He is succeeded in Pakistan by **W. P. G. MacLachlan.**

John M. Henton, Jr., southwest Louisiana exploration division geologist for The California Co., has been named a professional specialist.

John H. Williams, chief engineer of California Oil Co. since 1947, has retired after 34 years with the company and its affiliates.

A. S. Kasperik, director of research and development for Signal Oil & Gas Co., has moved his headquarters to Los Angeles from Houston.

Jack H. Riddle, chief of technical services for El Paso Natural Gas Products Co., has been promoted to division engineer in Odessa, Tex.

Dr. C. H. Bowman has joined Gulf Research & Development Co.'s production-engineering division in Pittsburgh as project engineer. Bowman was formerly with Texas Petroleum Research Committee in College Station, Tex.

John E. Gross, administrative assistant to the president of Mobil International Oil Co., has been appointed regional executive in the Middle East. He will be responsible for administering company interests in Iraq Petroleum Co., the Iranian Consortium, and Kuwait.

A. T. F. Seale, vice president of operations for Kerr-McGee Oil Industries, Inc., and **Grady D. Harris, Jr.,** president of the Fidelity National Bank & Trust Co., Oklahoma City, have been elected directors of Kerr-McGee.

Dr. Elroy J. Inchalik has been appointed head of the polymers-process research section in Esso Research & Engineering Co.'s chemicals-research division. He has been with the company since 1955.

▶▶▶ Personals

Donald T. Whalen has been promoted to marketing manager of Tidewater Oil Co. succeeding **J. Ronald Getty.** Getty recently was named president and general manager of Veedol International, new European subsidiary of Tidewater. Whalen had been western division marketing manager for the company. He joined Tidewater in 1955 as western division distributor sales manager. He also has been wholesale sales manager and retail sales manager for the division.

WHALEN

Hobson Mann, production engineer with King-Stevenson Oil Co., Inc., in Oklahoma City, has been named staff engineer, drilling department.

Justin Kimball has been named vice president of finance for Wilshire Oil Co. of California. He will supervise the company's financial activities in California, Arizona, and Nevada.

Dr. David T. Mowry, director of development in Monsanto Chemical Co.'s research and engineering division, St. Louis, has been appointed a development associate in the plastics division development department, Springfield, Mass.

H. T. Richardson, formerly general manager for exploration of Standard Oil Co. of Texas, has been named vice president and director. He succeeds **J. H. Todd,** who is transferring to California Oil Co., Western Division, as vice president of exploration-production in Denver.

▶▶▶ Deaths

O. P. Cunningham, owner of Salem Pipe & Supply Co., Salem, Ill., died October 23 after a long illness.

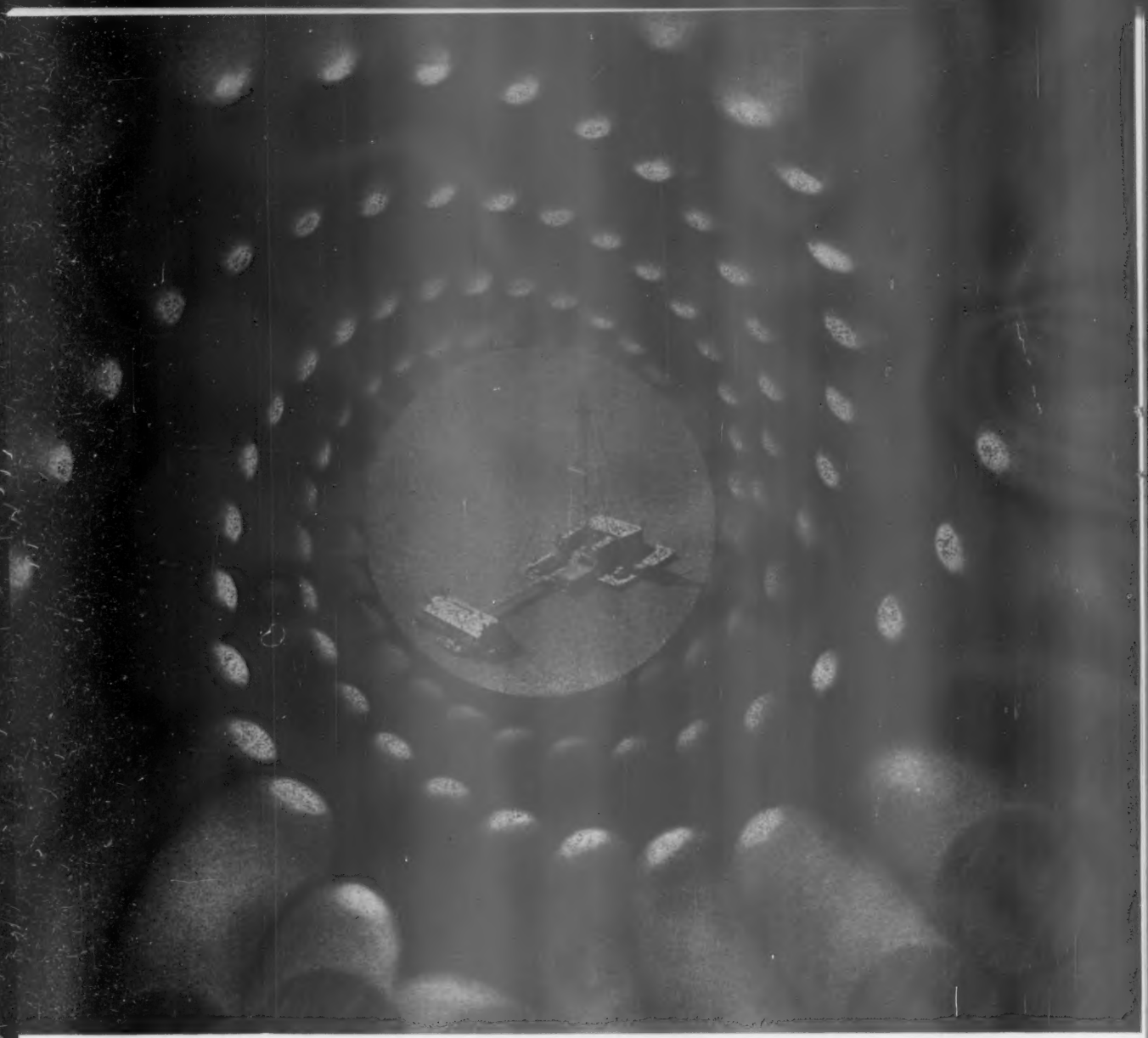
Edwin A. Wollet, 93, pioneer well shooter in Pennsylvania, Illinois, and Ohio, died October 15 in Ridgetown, Ont.

Ralph D. Hilborn, 62, controller of Jones & Laughlin Supply Division, died November 1 in El Paso, Tex. He was en route to his home in Tulsa after a vacation in Phoenix. Hilborn had been with J&L since 1938.

Donald R. Forsberg, 53, executive vice president of Gustafson Oil Co., Chicago marketing firm, died October 17 in Rochester, Minn. He had been with Gustafson since 1950.

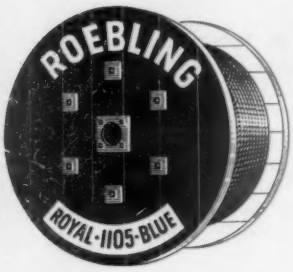
Alden Todd, Bedford, Ind., independent operator, died October 25 in an Indianapolis hospital.

Harry Cook, 57, purchasing agent for Pan American Petroleum Corp.'s Tulsa research center, died October 27 at his home in Tulsa after a heart attack.



ROEBLING ROYAL BLUE WIRE ROPE

WE PUT A LOT OF WORK INTO IT—YOU GET A LOT OF WORK OUT OF IT



This happens to be the inside view of Roebling Royal Blue — its core has been removed to show the uniformity and symmetry of the rope structure. You see how concerned we are with internal security.

We have to be. To make sure that Royal Blue will live up to the day-to-day demands made upon it. High stresses and unavoidable overloads, abrasion, fatigue, impact, crushing, sheave pressures and abusive drum-winding, to name the major ones.

Royal Blue goes through many inspections and tests—both internal and external —before reporting to work. This way we're sure that the rope we build will do what we sell it to do. These quality-control measures are your assurance that Royal Blue is made to save you money — anyway you look at it.

For details about hard-working Royal Blue, ask your wire rope distributor or write Roebling's Wire Rope Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities • John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

Lubes recover from sharp 2-year dip

BY JOHN C. CASPER

BOTH export and domestic demands for lubricants have experienced mild upturns in the past 2 years. However, there is nothing to indicate a continuation of this recent gain rate through the period of the sixties.

The all-time peak for lube demand came in 1951 when domestic demand averaged 115,900 bbl. daily and exports set a new record at 47,700 bbl. daily. Domestic demand was a little higher in 1956, but by then exports had dropped below 40,000 bbl. daily.

Early refiners in this country were fortunate in having good lube crudes. Since early processing involved little more than cutting out certain fractions plus a little dewaxing, the availability of good lube crudes made it possible for refiners in this country to build good export trade.

As far back as 1920, export demand for lubricants averaged better than 26,000 bbl. daily. The bottom line of the chart shows that even in the peak year 1951, lube exports fell a little short of 50,000 bbl. daily.

Note that there was a hump in the domestic demand curve during the expanding twenties. Passenger-car registrations almost doubled between 1922 and 1927. Those were the "T" Model days when the normal order at a "filling" station was 5 gal. of gas and a quart of oil. Registrations for 1922 totaled 10.7 million cars. By 1927 they numbered 20.1 million.

Then came the depression and the gain in registrations slowed to a crawl. Compared with the addition of almost 10 million cars in a 5-year period from 1922 to 1927, it took 20 years to add the next 10 million.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,838,185	UP	68,065	DOWN	109,541
Crude stocks	229,816,000	DOWN	1,737	DOWN	23,253
Completions	952	DOWN	139	DOWN	76
Refinery runs	7,934,000	DOWN	13,000	UP	443,000
Gasoline stocks	186,815,000	DOWN	187,000	UP	10,668,000
Kerosine stocks	36,626,000	DOWN	181,000	UP	3,591,000
Distillate stocks	178,924,000	UP	1,292,000	DOWN	2,622,000
Residual stocks	49,917,000	DOWN	1,012,000	DOWN	8,133,000
Four-product stocks	452,282,000	DOWN	88,000	UP	3,504,000
Total imports	1,518,600	DOWN	277,600	DOWN	145,900

Lubes' Low Point in 1932

This depression period also saw a drop in industrial production. Fewer cars and reduced industrial activity cut the need for lubricants. The low point of lube demand was reached in 1932. From that date until 1951, there was a steady upward climb. This was followed by a period of very little gain that lasted through 1959. Exports showed a steady decline from 1951 to 1959.

The table on this page shows the important shifts in lube production in this country since 1920. East Coast production has changed very little in the past 40 years. Appalachian production is down slightly from the average for 1920.

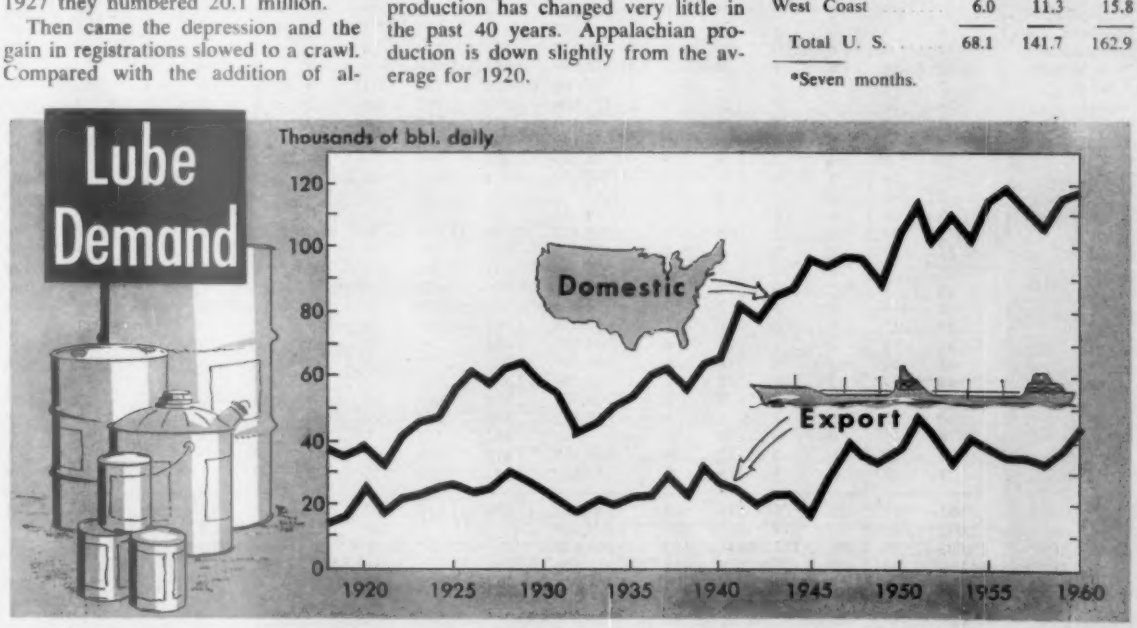
Note that the big gains have been on the Gulf Coast. The two major refining districts in that area have accounted for 71% of the gain in lube production over the past 40 years.

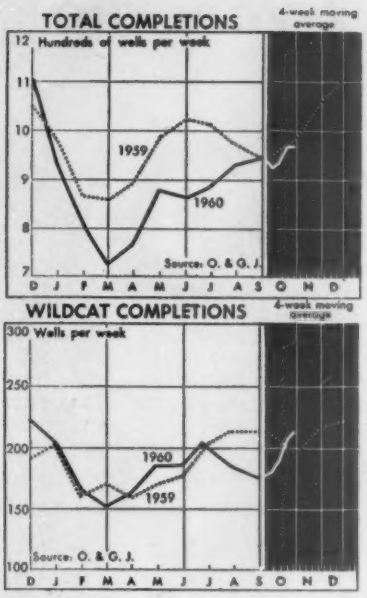
PRODUCTION OF LUBRICANTS BY DISTRICTS

(Thousands of barrels daily)

	1920	1950	*1960
East Coast	21.4	28.0	24.0
Appalachian	12.4	14.8	10.6
Ill., Ind., Ky.	8.2	13.1	12.7
Okla., Kans., Mo.	5.9	11.4	12.6
Texas Inland	0.5	0.2	0.5
Texas Gulf	11.5	45.4	62.4
La. Gulf	1.2	12.4	17.8
N. La., Ark.	0.1	4.4	5.6
Rocky Mtn.	0.9	0.7	0.9
West Coast	6.0	11.3	15.8
Total U. S.	68.1	141.7	162.9

*Seven months.





Active Rotary Rigs

	10-31-60	10-24-60	11-2-59
Alabama	1	2	5
Alaska	7	7	(†)
Arkansas	12	12	16
Arizona	2	2	1
California	70	72	97
Land	67	69	90
Offshore	3	3	7
Colorado	54	56	50
Florida	3	3	3
Land	2	2	2
Offshore	1	1	1
Georgia	1	1	0
Illinois	47	50	44
Indiana	10	9	7
Iowa	1	1	0
Kansas	105	104	143
Kentucky	4	5	8
Louisiana	271	278	316
North	33	37	44
S. Inland waters	104	95	113
S. Land	75	73	107
Offshore	59	73	52
Maryland	0	0	0
Michigan	26	28	37
Mississippi	57	61	68
Missouri	1	1	0
Montana	28	23	24
Nebraska	24	25	19
Nevada	0	0	1
New Mexico	97	88	120
New York	2	2	0
North Dakota	17	16	23
Ohio	5	5	4
Oklahoma	166	157	229
Oregon	0	1	0
Pennsylvania	6	10	13
South Dakota	0	0	5
Texas	569	572	719
S. Inland waters	8	9	3
S. Land	141	156	176
Offshore	1	1	4
North	38	43	185
Panhandle	48	44	(*)
East	56	56	(*)
West Central	167	151	212
West	110	112	139
Wisconsin	1	0	0
Utah	30	26	30
Washington	1	1	2
West Virginia	9	6	5
Wyoming	76	68	83
Total U. S.	1,703	1,692	2,072
Western Canada	142	149	170
Eastern Canada	1	1	1
Grand total	1,846	1,842	2,243

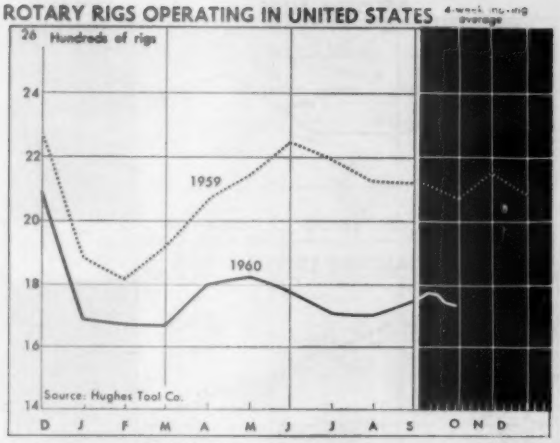
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 29, 1960

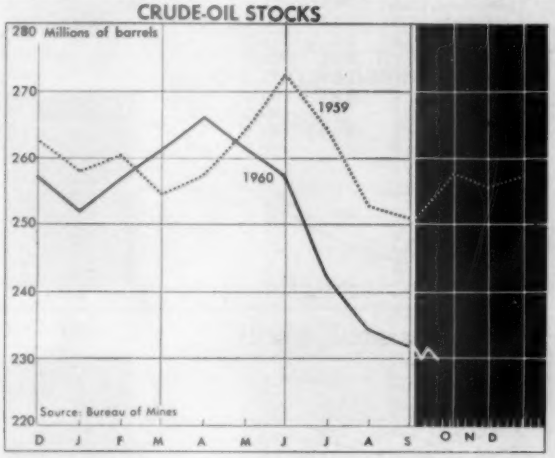
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	3	1	0	0	2	0	34,306	39	80	2	0	0	0	2	4	20
Arizona	0	0	0	0	0	0	0	29	24	0	0	0	0	0	19	22
Arkansas	17	13	0	0	4	0	47,567	498	702	1	0	0	0	1	127	124
California	35	23	0	3	9	0	142,112	1,374	1,284	5	0	0	1	4	252	336
Colorado	17	3	0	3	11	0	85,555	527	638	11	1	0	0	10	272	366
Illinois	66	18	0	0	25	23	133,025	1,905	1,906	12	1	0	0	11	403	316
Indiana	23	6	0	0	14	3	38,699	878	692	6	1	0	0	5	320	237
Kansas	109	51	0	4	41	13	291,161	3,298	3,308	22	2	0	1	19	874	869
Kentucky	91	27	0	14	50	0	112,256	1,770	2,212	28	6	0	1	21	186	261
Louisiana	97	44	9	15	29	0	684,287	2,998	3,122	12	0	1	0	11	464	425
North	48	16	0	15	17	0	194,881	1,145	1,219	5	0	0	0	5	222	192
South	35	22	4	0	9	0	342,376	1,438	1,562	6	0	0	0	6	214	218
Offshore	14	6	5	0	3	0	147,030	415	341	1	0	1	0	0	28	15
Michigan	19	7	0	2	10	0	70,923	781	544	8	0	0	0	8	213	148
Mississippi	14	5	2	0	7	0	148,357	568	535	6	1	0	0	5	218	234
Montana	8	5	0	1	1	1	25,499	274	273	3	1	0	1	1	128	89
Nebraska	24	4	0	0	20	0	129,739	734	752	16	1	0	0	15	318	324
New Mexico	31	18	0	4	9	0	154,999	1,553	1,736	4	0	0	0	4	220	201
West	7	2	0	4	1	0	39,009	552	784	1	0	0	0	1	61	53
East	24	16	0	0	8	0	115,990	1,001	952	3	0	0	0	3	159	148
New York	0	0	0	0	0	0	0	258	217	0	0	0	0	0	38	19
North Dakota	6	4	0	0	2	0	39,149	248	372	2	1	0	0	1	68	67
Ohio	22	9	0	2	8	3	66,209	891	879	4	0	0	1	3	44	24
Oklahoma	67	34	1	4	25	3	245,874	3,814	4,625	8	3	0	0	5	591	708
Pennsylvania	0	0	0	0	0	0	0	592	441	0	0	0	0	0	13	10
South Dakota	2	0	0	0	2	0	9,368	21	15	2	0	0	0	2	10	7
Texas	252	134	20	12	83	3	1,088,949	12,989	15,674	50	6	2	0	42	2,677	2,946
Dist. 1	23	17	0	0	6	0	52,503	926	903	5	0	0	0	5	337	277
Dist. 2	13	1	3	2	7	0	93,206	635	662	4	0	0	0	4	157	196
Dist. 3	21	8	2	0	11	0	170,719	986	1,002	6	1	0	0	5	187	198
Dist. 4	12	3	6	1	2	0	58,924	888	1,124	3	1	2	0	0	246	271
East	26	15	0	0	11	0	130,814	1,063	1,060	8	0	0	0	8	223	202
Dist. 7-B	33	12	1	1	19	0	104,753	1,868	2,153	11	2	0	0	9	527	580
West	54	41	2	0	11	0	280,539	3,320	4,727	8	2	0	0	6	515	645
Dist. 9	44	27	3	0	12	2	93,119	2,429	2,959	3	0	0	0	3	435	486
Dist. 10	26	10	3	8	4	1	104,372	874	1,084	2	0	0	0	2	50	91
Utah	4	2	0	0	2	0	20,182	193	256	1	0	0	0	1	72	69
West Virginia	0	0	0	0	0	0	0	652	651	0	0	0	0	0	7	27
Wyoming	21	7	0	2	12	0	110,185	873	799	9	1	0	0	8	358	283
*Misc.	24	2	0	9	13	0	69,820	141	81	16	2	0	1	13	123	54
Total U. S.	952	417	32	75	379	49	3,748,221	37,898	41,818	228	27	3	6	192	8,019	8,186
Previous week	1,091	483	32	79	387	110	4,047,308	.....	.....	217	22	3	4	188	.....	.....
Cum. 1960	37,898	17,099	1,108	3,117	14,464	2,110	157,201,879	.....	.....	8,019	724	87	270	6,938	.....	.....
Cum. 1959	41,818	20,780	1,027	3,121	15,718	1,172	173,471,660	.....	.....	8,186	737	94	270	7,085	.....	.....
Western Canada	62	32	0	7	23	0	314,248	1,904	2,004	23	1	0	5	17	508	555

*Nev., Va., Idaho, Wash, Tenn.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-22-60	10-15-60	10-24-59
Pennsylvania	2,345	2,338	2,549
Other Appalachian	1,479	1,443	2,117
Illinois, Indiana, Michigan	8,538	9,007	9,666
Nebraska and North Dakota	2,626	2,727	3,130
Kansas	8,514	8,434	9,310
Oklahoma	15,083	15,217	14,950
Arkansas	1,746	1,842	2,097
Louisiana	17,480	17,824	17,763
North	3,039	2,995	3,305
South	14,441	14,829	14,458
Mississippi, Alabama, Florida	1,905	1,992	2,183
New Mexico	8,433	8,235	8,630
Texas	97,372	97,894	111,398
East Texas	7,496	7,505	8,017
West Texas	47,123	48,525	52,676
Texas Gulf	17,025	16,311	19,886
Other Texas	25,727	25,553	30,819
Wyoming	14,714	15,180	16,405
Other Rocky Mountain	9,555	9,802	9,606
California	25,575	25,804	28,577
Foreign	†14,451	13,814	14,688
Total	**229,816**	231,553	253,069

*Bureau of Mines. †Includes 4,883,000 bbl. in California.

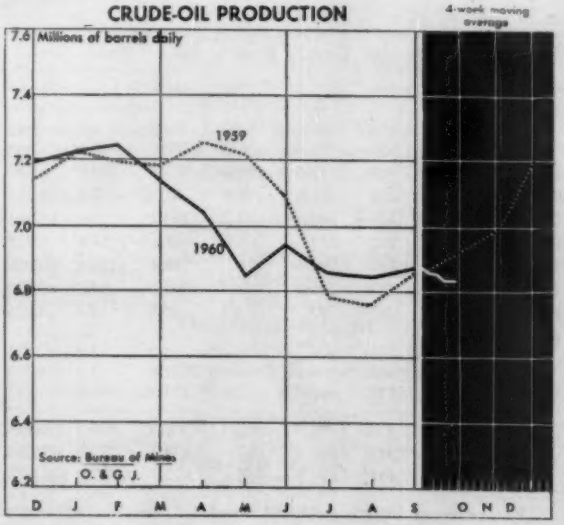
DAILY AVERAGE PRODUCTION FOR WEEK

	October 29, 1960			Oct. 22
	Crude oil	Lease condensate	Total	total
Alabama	19,900	.....	19,900	21,000
Arkansas	77,125	200	77,325	77,300
California	825,900	.....	825,900	826,800
Colorado	132,700	.....	132,700	130,100
Eastern	40,900	.....	40,900	39,800
Florida	1,000	.....	1,000	1,000
Illinois	219,400	.....	219,400	217,700
Indiana	32,400	.....	32,400	31,300
Kansas	†304,660	.....	†304,660	†293,870
Kentucky	57,000	.....	57,000	56,700
Louisiana	945,750	125,700	1,071,450	1,071,450
North	104,750	5,950	110,700	110,700
South	841,000	119,750	960,750	960,750
Michigan	43,800	.....	43,800	42,000
Mississippi	134,000	3,800	137,800	137,800
Montana	82,700	.....	82,700	82,300
Nebraska	67,400	.....	67,400	69,000
Nevada	50	.....	50	50
New Mexico	285,000	8,700	293,700	293,700
North Dakota	65,000	.....	65,000	61,400
Oklahoma	†492,000	.....	†492,000	†506,200
Texas	2,331,000	82,575	2,413,575	2,413,575
Dist. 1	43,000	2,500	45,500	45,500
Dist. 2	97,000	8,100	105,100	105,100
Dist. 3	297,000	36,500	333,500	333,500
Dist. 4	169,000	11,900	180,900	180,900
Dist. 5	25,000	300	25,300	25,300
Dist. 6	101,000	10,000	111,000	111,000
East Texas field	121,000	.....	121,000	121,000
Dist. 7-B	121,000	150	121,150	121,150
Dist. 7-C	114,000	3,050	117,050	117,050
Dist. 8	948,000	7,500	955,500	955,500
Dist. 9	194,000	1,650	195,650	195,650
Dist. 10	101,000	925	101,925	101,925
Utah	94,500	.....	94,500	32,500
Wyoming	363,400	.....	363,400	362,900
Others	‡1,625	.....	‡1,625	‡1,675
Total U. S.	6,617,210	220,975	**6,838,185**	6,770,120
Change from prev. week, up			**68,065**	
Canada	†486,798	.....	†486,798	†505,200

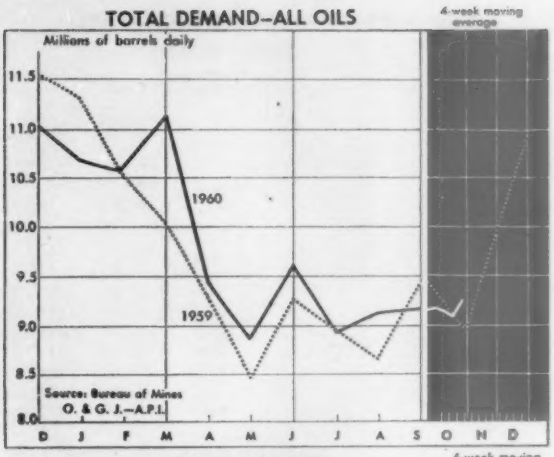
Total U. S. prod., January 1-October 29 ..... 2,115,722,600 bbl.
Same period last year (crude plus cond.) ..... *2,128,307,200 bbl.

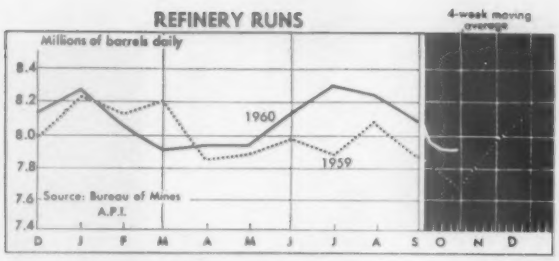
*Includes 56,572,200 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

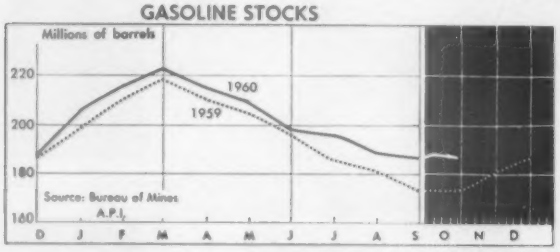
CRUDE-OIL PRODUCTION

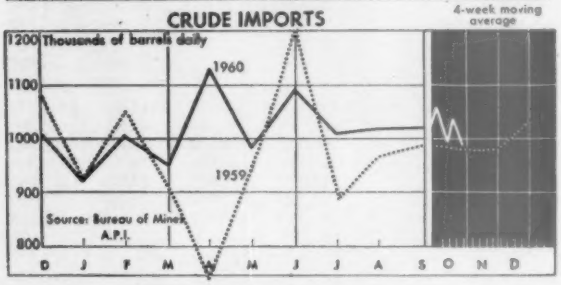


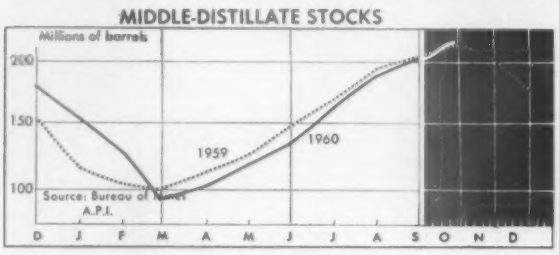
REFINING

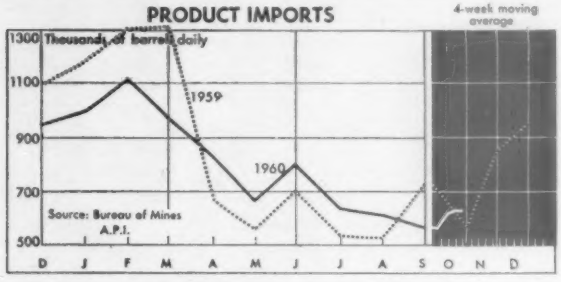


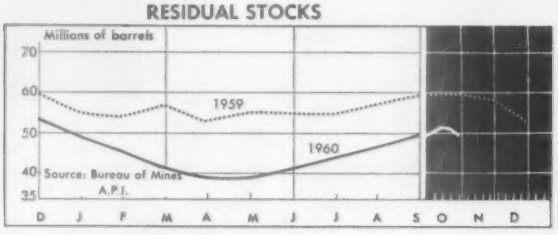












API REFINERY REPORT—OCTOBER 28, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,146	510.3	33.0	342.4	144.7	45,442	15,205	71,356	13,211	1,051	469.7	21.3	325.0	150.0
Appalachian:														
District 1	54	19.4	0.6	10.9	4.1	5,593	831	4,547	515	91	39.3	2.5	20.0	9.0
District 2	109	59.7	6.7	20.9	13.1	3,004	454	1,863	262	104	51.3	5.8	17.9	8.8
Ind., Ill., Ky.	1,409	719.0	68.3	311.3	144.0	30,367	7,363	31,911	6,763	1,421	739.2	64.0	311.8	134.5
Minn., Wis., Dak.	129	61.9	4.9	32.3	18.4	6,592	1,638	8,851	589	71	31.2	0.8	14.9	11.3
Okla., Kans., Mo.	673	344.7	17.7	161.1	19.3	15,967	1,743	14,177	1,013	688	385.6	16.2	170.2	24.1
Inland Texas	262	235.6	9.7	45.1	14.8	6,735	604	1,646	2,545	287	212.4	9.1	48.7	18.2
Texas Gulf Coast	1,892	1,009.4	126.7	510.4	130.4	24,932	3,656	18,497	6,421	1,718	910.3	102.5	412.0	143.6
La. Gulf Coast	663	356.7	61.7	141.3	48.9	10,670	2,392	6,020	1,424	693	378.5	55.3	150.1	54.6
N. La. and Ark.	107	63.7	6.8	20.6	6.0	5,605	1,019	2,826	135	67	25.8	2.2	17.9	5.3
Rocky Mountain:														
New Mexico	10	6.7	0.6	1.7	1.1	772	47	166	30	27	14.7	0.5	5.3	2.8
Other	88	139.3	4.0	61.6	31.3	5,203	352	2,993	1,094	277	135.2	2.6	60.9	32.1
West Coast	1,192	469.0	21.4	191.3	240.4	25,933	1,322	14,071	15,915	1,152	507.1	3.8	181.3	275.0
Oct. 28, 1960	7,934	3,995.4	362.1	1,850.9	816.7	186,815	36,626	178,924	49,917	7,647	3,900.3	386.6	1,736.0	869.3
Oct. 21, 1960	7,947	4,043.0	417.0	1,818.3	772.6	187,002	36,807	177,632	50,929	.....	.....	.....	.....	.....
Oct. 30, 1959	7,491	3,891.3	268.6	1,692.7	897.0	176,147	33,035	181,546	58,050	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin 3.00-3.05

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao 1.72
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qata, 41.0°-41.9°, Umm Said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Smiley (Sask.) 2.18
- Pembina 2.38

Venezuela:
- Cumbarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)
- Carib.-NY, dirty (ATRS—50%) $1.38
- ★ Carib.-Med., dirty (Scale—52.5%) (17s. 3d.) 2.41
- PG-Japan, dirty (USMC—60%) 4.08
- ★ PG-Italy, dirty (Scale—40%) (27s. 8d.) .. 3.86

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- Regular (91 octane) .. $12.25-12.50
- Premium (99 octane) .. 15.00-15.25
- Natural gasoline (26-70) .. 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 11.00
- Regular (92 octane) .. 11.25
- Premium (98 octane) .. 12.25

California (rack) Los Angeles:
- Regular (88 octane) .. 11.65-12.15
- Premium (94 octane) .. 12.65-13.15
- Premium (100 octane) 14.00-14.65

Caribbean area (cargoes):
- Regular (87 octane) .. 10.125-10.25
- Premium (97 octane) .. 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
- Kerosine 42-44 .. 10.375
- Diesel oil (58 d.i. and above) 10.00
- Distillate No. 1 ..... 10.00
- Distillate No. 2 ..... 9.00

Gulf Coast (cargoes):
- Kerosine 41-43 ..... 9.00- 9.25
- Distillate No. 2 ..... 8.25

New York Harbor (barges):
- Kerosine 41-43 ..... 10.45
- Distillate No. 2 ..... 9.45
- Diesel fuel, 48-52 d.i. 9.65

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max. 1% S) $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C 2.10

California (rack):
- Bunker C fuel, Los Angeles 2.25

CLASSIFIED ADVERTISING

. . . your market place

for the oil and gas industry

RATES:
UNDISPLAYED CLASSIFIED 30c a word per issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

DISPLAY CLASSIFIED
$20.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal P. O. Box 1260, Tulsa 1, Okla.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287.

FOR SALE EQUIPMENT

WALKER-NEER C-34, Automatic cathead, tools, doghouse, lightplant, float, GMC truck to move equipment. Phone S. H. Lindley, HI 9-2884, Breckenridge, Texas.

FOR SALE: by Kimrock Tidelands, Inc. Two Wells and Tank Battery complete with all equipment, Tennessee Colony Field, Anderson County, Texas. For further information, call or write: E. S. Doyle, P. O. Box 896, New Orleans 2, Louisiana.

1—CHICAGO PNEUMATIC Rotary Compressor, new GM Diesel Model # 900 RO-2, a real bargain. For additional information contact Wm. D. Brownlee & Co., 244 S. College St., Washington, Pa. Phone: BA 5-3355.

PETRO-CHEM ISO-FLOW FURNACES
with STAINLESS CONE & TIP
9MM BTU/HR. Duty; 20′ Stack
7MM BTU/HR. Duty; 44′ Stack
2MM BTU/HR. Duty; 36′ Stack
HEAT & POWER CO., INC.
60 East 42nd Street; New York 17, N. Y.
310 Thompson Building; Tulsa 3, Okla.

—PIPE—

2,000,000 ft.	2″	3.50# to the ft.
1,000,000 ft.	3″	7.70#
1,000,000 ft.	4″	10.98#
500,000 ft.	6″	19.80#
200,000 ft.	8 5/8″	28#
400,000 ft.	10¾″	35#
75,000 ft.	12¾″	40#
50,000 ft.	18″	59#

All No. 1 Grade Plain end and cleaned
INDIANA-OHIO PIPE CO.
P. O. Box 5412 Shop. Sta.
Columbus 19, Ohio
Phone CL 3-5527

FOR SALE
LOCATION HOUSTON, TEXAS

HEAT EXCHANGERS
50 to 4,000 sq. ft.

VESSELS AND TOWERS
12″ to 10′ dia.

TANKS AND SPHERIODS
5,000 to 29,000 bbl.

FURNACES
½ MM to 35 MM BTU.

PUMPS
50 to 7,000 gpm.

Your Inquiries Solicited

WIRE — PHONE — WRITE
SEND FOR COMPLETE LISTINGS

BRILL EQUIPMENT COMPANY

4101 SAN JACINTO ST., HOUSTON 4, TEXAS
JA 6-1351
35-65 JABEZ ST. NEWARK, N. J.
MA 3-7420

FOR SALE EQUIPMENT

LIQUIDATION AT ESSO STANDARD OIL REFINERY, BATON ROUGE
400 HP Compressors; Towers; Vessels; Heat Exchangers; Pumps.

For further information contact:

Chemical & Refinery Equipment Co.
Box 19351, Houston, Texas
Phone HO 8-1317

OR

Louisiana Steel Compress Co.
Box 566, Baton Rouge, La.
Phone DI 8-5371

FOR SALE: Wagner-Morehouse portable drilling, workover, and pulling rig, with transmission, torque converter, air clutches, drilling line, sandline, blocks, hook, automatic catheads, 96 ft. mast, subbase, table. Trailer mounted. White tractor. $45,000. Terms. 1705 Burton Way, Bakersfield, Calif.

FOR SALE:

50,000 Ft. 12¾″ OD .281″ Wall, New Prime, Electric Weld Pipe API 5L Grade X-42 P. E. Bev., DRL.

$2.75 Per Ft.—Car Load Lots Only

7″ OD 23# New Sub Std. Smls. Casing, 8-Rd-Thd ST&C Range 1 & 2 API Drifted and Hydrostatically Tested to 4,000 Lbs. PSI.

$1.75 Per Ft.—Loaded Cars or Trucks

TEXAS PIPE AND SUPPLY COMPANY, INC.
1700 Block Maury Street
P. O. Box 1331, Houston 1, Texas

10″ LINE PIPE

17,000′—10¾″ O.D., 40.48# Lapweld Line Pipe, 20′ SRL, Fully Reconditioned, #1 Grade. Suitable line pipe or can shop for casing.

Located near Tulsa.
Priced low for quick sale.

MID-STATES PIPE AND SUPPLY CO.
703 Philtower Bldg., LUther 2-9128
Tulsa 3, Oklahoma

LIQUIDATION
at ESSO REFINERY Balto., Md.
30 DAYS TO GO—CHOICE
Equipment Still Available
Send Us Your Requirements

HEAT & POWER CO. INC.
60 East 42nd St., New York 17, N.Y.
310 Thompson Bldg., Tulsa 3, Okla.
Box 5203, Baltimore 24, Maryland

FOR SALE EQUIPMENT

ROTARY DRILLING Rig for sale. 1,200 ft. capacity. Overhauled. Double drum $8,000. Los Angeles, DI 0-6696.

40 HP LITTLEFORD Quick Steam Generator, gas fired. Needs new coil, otherwise A-1 condition. Paul E. Lawrence, RFD #5, Ponca City, Okla. Phones RO 5-5418 and RO 5-8761.

CLARK CENTRIFUGAL Compressor 10,000 CFM, 240 PSI; Carrier 1,000 ton Refrigeration Compressor turbine drive; 2 I.R. Turbo Exhausters 15,000 and 17,000 CFM, 4.85 PSI; Worthington LT6 Compressor; Hot Oil Pumps 50 to 7,000 GPM. Brill Equipment Co., 4101 San Jacinto Street, Houston, Texas.

ROTARIES, SPUDDERS, Core Drills. Tank mounted service trucks. New & Used equipment. Complete supplies. Money-saving prices. Nation-wide service. If you want to buy or sell, contact: Pressey & Son, Pueblo, Colorado.

WALKER-NEER C-34 spudder with 143 GKU Waukesha engine. 6,000′ ⅞″ sand line, plastic covered hemp. 5,800′ ¾″ drill line, plastic covered hemp. Complete set of tools; tool house, skid mounted. All equipment in A1 condition. Contact Bradford Supply Company, Wichita Falls, Texas, Phone 723-2761.

3 LE ROI V-12 RX15VW gas/butane engines. Complete with radiators, skids, clutches, starting engines. Two engines good condition $3,000 each. One recently overhauled $3,500. 3814 N. Santa Fe, Oklahoma City, Oklahoma.

EQUIPMENT WANTED

1-30-35 H.P. AJAX Gas Engine. A-1 late model. Sell or Trade 2-75 H.P. G. E. Tri Clad Motors, 440 Volt, 880 RPM Controls—New Guarantee. Marvin E. Boyer Oil Co., Box 35, Iola, Kansas.

WILL TRADE LOTS in Fort Worth-zoned Heavy Industrial—with Santa Fe trackage—for drilling equipment. Contact: Lee Hicks or Bill Grier. Tel. MA 4-1174 or MA 4-1175, P. O. Box 1302, Fort Worth 1, Texas.

WANTED: Packaged gas compressor unit with 40 to 55 HP compressor (preferably Worthington) with cylinder to stand 600 or more PSI and gas engine all skid mounted. Box M-139, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

SALES MANAGER

Established Corporation has opening. Experienced in sale of engines and pumps.

P. O. Box 1697
Houston 1, Texas

HELP WANTED

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

YOUNG PETROLEUM engineer to age 30 with approximately 3 years drilling and production field experience preferably with major company for employment with large independent producer. To reside and work at present time in eastern Oklahoma. Should be available in immediate future. Salary commensurate with ability and experience Box M-142, The Oil and Gas Journal, Tulsa Oklahoma.

SALES ENGINEER

Should have Electrical or Mechanican Engineering degree. Technical sales experience desirable. Send resume to Leon H. Becker, Howell Instruments, Inc., 3479 West Vickery Blvd., Fort Worth 7, Texas.

CORROSION ENGINEER

Experienced in Pipe Line Cathodic Protection, for work in Australia. Eighteen months expected duration on job requiring man qualified to make initial soil and resistivity survey, detailed reports, design, prepare plans and specifications for system, supervise construction, establish operating procedures and maintenance schedules, and serve as contact man between interested parties.

Salary commensurate with qualifications.

Give full particulars including experience record, references, and availability to:

J. R. Henderson
PIPE LINE TECHNOLOGISTS, INC.
P. O. Box 22146 Houston 27, Texas

WANTED GEOLOGIST

With proven ability and experience in principal producing areas of Louisiana, Texas and New Mexico for position of chief geologist, sizable company having progressive, moderate size independent exploration and production division with several district offices in various areas, in addition to principal production and exploration office. Must have good records of discoveries. 38 to 45 years of age. Will pay well for right man.

Send complete details with recent photograph to:

Box M-144
The Oil and Gas Journal
Tulsa, Oklahoma

MECHANICAL ENGINEER

(Manuals Editor)

OVERSEAS

Staff position with Iranian Oil Refining Company in Iran.

Background should include several years with a large organization, preferably a refinery, engaged in work of a mechanical nature with some manuals writing experience. To coordinate and expedite Refinery Mechanical operations manuals program.

Liberal salary, biennail home furlough, family housing available.

WRITE giving full details including education and resume of experience.

BOX 518-A
Radio City Station
New York 19, New York

HELP WANTED

REFINERY COST ESTIMATOR

West Coast Independent Oil Company has immediate need for qualified degree engineer with 10 to 20 years experience in engineering, construction and cost estimating. Duties involve the development and maintenance of cost standards; "flow-sheet" estimating for economic studies; estimating major construction projects; budget preparation and cost control. Minimum of 6 years experience in cost estimating for major contract work required.

Inquiries held confidential.

Forward resume, including education, background and references to:

Box L-991
The Oil and Gas Journal
Tulsa, Oklahoma

EXPLORATION GEOLOGIST, must have both South Louisiana and Texas Gulf Coast experience of not less than 10 years in exploration. Age 35 to 45. Resume and photo to: Box M-143, The Oil and Gas Journal, Tulsa, Oklahoma.

STAFF ENGINEER: Owner and operator of several natural gas processing plants, with home office in north Louisiana, has immediate need for man with engineering degree and at least five years experience in operation of gas processing plants and related facilities. Duties involve maintenance and process trouble shooting and general plant engineering. Salary commensurate with experience and ability. Submit recent photograph and complete resume of formal education and employment history to: Box M-138, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL CHEMIST

Research Chemist with PhD or MS in chemistry and minimum five years experience in basic research in oil additives. Interested and proficient in synthetic work. Excellent growth opportunity.

Please send resume to:
Carlisle Chemical Works, Inc.
West Street, Reading, Ohio

SITUATIONS WANTED

CHEMICAL ENGINEER, 15 years refining industry experience, startup, operations, economics, supervision, planning, domestic and foreign, available immediately, any location. Box M-148, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST, 6 years experience Gulf Coast, Venezuela, married consider any position or location. Box M-131 The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPERINTENDENT

With good administrative background in foreign operations desires foreign employment.
Box M-145, The Oil and Gas Journal
Tulsa, Oklahoma

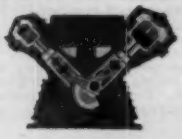
SITUATIONS WANTED

GRADUATE PETROLEUM Engineer, age 40, 15 years of management experience, seeks position in management or sales engineering, either domestic or foreign. References and resumes furnished on request. Box 31R927, The Oil & Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

PETROLEUM ENGINEER, 5 years experience in Rocky Mountain Area, Married, consider any location. Box M-150, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: Four years diversified, production. O.U. graduate, age 33. Will relocate: Harold Lechtenberg, 5101 N.W. 47th, Oklahoma City.

EXECUTIVE, AGE 43, Naval Academy graduate. Presently treasurer and general manager, available soon. Experience includes leasing, drilling, production, purchasing, accounting, financing (public, private, debt, and equity,) taxes, contracts, administration, farmouts. An extra is 4,000 hours flying experience. Box M-147, The Oil and Gas Journal, Tulsa, Oklahoma.



ANSWER

to Worthington Hidden Value Puzzle

The fictitious "hidden value" shown on page 149 is, of course, the "Articulated Connecting Rod." This design is found only on light duty compressors with single acting cylinders.

The true Worthington connecting rod construction is shown above. Each rod is directly mounted on the main crankshaft, giving greatest bearing area and stronger linkage. There are fewer parts in all, maintenance is simpler and lubrication is less complex. Worthington Corporation.

SITUATIONS WANTED

EX-DRILLING CONTRACTOR, 36, capable of roughneck to management desires connection as Supt. or pusher. Can solicit work. Would buy rig on footage basis. Box M-156, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP! MAJOR OIL field potential. Independent geologist has numerous first class prospects in Rockies and Permian Basin. Need contact with aggressive independent or investment group with exploration capital. Reliability and honesty a necessity. Retainer-interest or other suitable arrangement desired. References exchanged. Box M-157, The Oil & Gas Journal, Tulsa, Okla.

LEASE AND DRILLING BLOCKS

CAN FURNISH two thousand acre block solid, ten year leases, Good geology, Excellent gas prospect, Central Texas. Box M-140, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL BUY PRODUCING Royalty, Minerals, or Overrides. Send price and particulars to American Mutual Oil Company, 1640 Court Place, Denver 2, Colorado.

FULLY EQUIPPED Sunset Oil well producing $900 for sale. $11,000 will salvage much more. MU 1-9458, 504 Hollingsworth Bldg., Los Angeles.

CUMBERLAND COUNTY, Kentucky: 1,600 acres checkerboarded old Granville Sand Shallow producing oil field. New drilling should test Lebanon and Knox formations Long term leases. Price $3.50 per acre. Write wire, phone. W. V. Cravens. Russell Springs Kentucky.

FOR SALE: Proven 25 acres offset to water flood. 750 ft. Bartlesville Sand. $400.00 per ⅛ test 1st well. Own rig and tools. Eastern Kansas. Well ready to start. Box M-153, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Latimer County, Oklahoma, 16,000 acres fee land with one-half minerals under oil lease to major company paying $1.00 rental. Estimate of standing timber worth $15.00 per acre. Located in Townships 4 and 5 North, Ranges 20-21-22 East, and near oil and gas production. Full cash price $27.50 per acre. Contact R. M. Sims, 309 8th Avenue S.W., Calgary, Alberta, Canada. Telephone AM 9-3044.

NOTICE OF SALE OF OIL, GAS, AND SULPHUR LEASE

Pursuant to the provisions of Chapter 150 of the General and Special Laws of the State of Texas, passed by the 45th Legislature at its Regular Session, as amended by Senate Bill No. 248, passed by the 53rd Legislature at its Regular Session, the Board of Directors of the Agricultural and Mechanical College of Texas hereby offers for sale at public auction in the Office of the Comptroller, Room 202, System Administration Building, College Station, Texas, at 10:00 a. m. Monday, November 21, 1960, an oil, gas, and sulphur lease on 200 acres in Reeves County, Texas, being the same land conveyed by Sol Mayer and Wife to the State of Texas by deed dated November 9, 1923, recorded in Volume 57, page 628, Deed Records of Reeves County, Texas, and being under the exclusive control of the Board of Directors of the Agricultural and Mechanical College of Texas, and occupied by the Texas Agricultural Experiment Station. The right is reserved to reject any and all bids. For lease forms and particulars, address: Comptroller, Texas Agricultural and Mechanical College System, College Station, Texas.

AVAILABLE FOR SALE

COLORADO OIL SHALE

Crushed to minus 8 inch

WRITE:

Commercial Development Division
Union Oil Co. of Calif.
P. O. Box 76, Brea, California

BUSINESS OPPORTUNITIES

WE'RE IN BUSINESS TO MAKE MONEY!

(Well, aren't you?) Ultimately, we're in business to help *you* make money. If you have no use for the stuff, then you may have no use for us.*

New money comes from new products, new concepts, new materials—ultimately, from new customers and new ideas. And we have pipelines to all of these. But customers have to be found, and sometimes they lurk in the most unexpected places. Our files are full of such examples. Once they are found, it is a good idea to offer them what they want. This not only promotes good will, but is intended to be highly profitable.

That's one of the places we might come in. Our services include industrial market research, product studies, engineering problems, consultation to management and diversification studies. We have a whole section devoted to problems of the oil industry and we can show you some money-saving ideas that might surprise you. Why not come by or write us?

THE McLAUGHLIN COMPANY

Suit 1803, 211 North Ervay Building, Dallas, Texas
RIverside 8-6695

**Although we have been known to render some very helpful services to certain intentionally non-profit organizations.*

LEASE AND DRILLING BLOCKS

FOR SALE: Drilling deals, royalties, ors, fee land. Box M-154, The Oil and Gas Journal, Tulsa, Oklahoma.

WE CAN FILE your application for 10 year oil and gas lease on U. S. lands in Utah or Wyoming. John L. Donahue, 430 16th St. Denver, Colorado, Phone AL. 5-1087.

4/8 WORKING INTEREST available. 2,700' Lower O'Hara-McClosky test. Illinois Basin. S. E. C. registered. Sub-surface geological studies indicate closed structural dome with possibility of five pays. 857 acre block located between two major fields, total cumulative production 18,000,000 barrels oil—1,700' to nearest field. Will consider only serious inquiries, accompanied by personal and financial references. Box M-159, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL AVAILABLE

CLIENT DESIRES to purchase profitable oil and/or gas production. Must stand rigid inspection. Reply in detail to W. K. Barker, Geologist and Petroleum Engineer, 1701 Westridge Rd., Los Angeles 49, California.

BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

PRODUCTION WANTED

WANTED: Settled Production: 20 to 100 bbl. per day in Oklahoma or Kansas. Box M-141, The Oil and Gas Journal, Tulsa, Oklahoma.

TO CHANGE YOUR ADDRESS

IT'S BEST . . .
to send your old address clipped from the Journal mailing wrapper along with your new location.

ADVANCE NOTICE . . .
10 days before you move, and we guarantee you week-to-week undelayed service.

WRITE . . .
Circulation Department

THE OIL AND GAS JOURNAL
Box 1260 **Tulsa 1, Okla.**

BUSINESS OPPORTUNITIES

PUBLICLY HELD producing company showing small profit with $350,000.00 tax loss available for merger. Has many proven locations with ready gas market at 25 cents per M. Box M-146, The Oil and Gas Journal, Tulsa, Oklahoma.

OILFIELD PRODUCTION equipment manufacturer has several choice areas open on exclusive distributorship basis. Write to P. O. Box 7288, Houston 8, Texas.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

Thinking of Retiring?

But no one to carry on the business. Quite a problem! Of course you want to provide continuity of service for clients and it is a great pity to allow your goodwill, probably built up over many years, to be wasted.

Could I Help?

As an independent professional manager I could arrange with you to handle your business on your terms. You, your clients, and I would all benefit from such an arrangement. Why not write to me, in strict confidence, to see what we could mutually arrange.

Box M-155, The Oil and Gas Journal
Tulsa, Oklahoma

PRODUCTION FOR SALE

WATERFLOOD FOR SALE

Labette County, Kansas, 100 acres floodable. 14 acres now in operation as pilot flood lease, all electrified and oil lines and water input lines laid, water supply well and complete treating plant in operation.

The Veeder Supply & Development Co., Cherryvale, Kansas

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that three parcels of land totaling 400 acres, within the known geologic structures of the East Adams Ranch and Hugoton fields, Meads and Morton Counties, Kansas, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, December 15, 1960, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Adjudication Unit.

ADVERTISERS

. . . in this issue

A

ACF Industries, Incorporated, W-K-M Division ... 47
Air Preheater Corporation, The ... 48
Albertson & Co., Inc. ... 33, 34
Allen-Bradley Co. ... 6
Allied Chemical Corporation ... 81, 167-172
General Chemical Division ... 169
Nitrogen Division ... 81, 170
Plastics Division ... 171
Solvay Process Division ... 168
Amercoat Corporation ... 192
American Cyanamid Company, Refinery Chemicals Department ... 16
American Iron & Machine Works Company Subsidiary, American Machine & Foundry Company ... 184
American Machine & Foundry Company — American Iron & Machine Works Co. ... 184
American Messer Corporation ... 195
American Meter Company ... 194
Armco Drainage & Metal Products ... 23
Associated Electrical Industries Export, Ltd. ... 154

B

Baker Oil Tools, Inc. ... 88
Ball Brothers Research Corp. ... 180
Baroid Division, National Lead Co. ... 9
Barton Instrument Corporation ... 83
Bendix Corporation ... 28
Black, Sivalls & Bryson, Inc. ... 15
Bovaird Supply Co., The ... 1
Bowen Itco, Inc. ... 36
Braden Winch Company ... 82

C

Cardwell Mfg. Co., Inc. ... 73
Caterpillar Tractor Co. ... 50, 51
Central Scientific Co. ... 190, 191
Chart-Pak, Inc. ... 196
Cherokee Laboratories, Inc. ... 193
Chevrolet Division of General Motors ... 186, 187
Chiksan Company ... 18
Classified Advertising ... 232, 233, 234
Climax Engine Manufacturing Co., Division of Waukesha Motor Company ... 60
Collins Radio Company ... 19
Computers, Incorporated ... 84
Cooper-Bessemer Corp., The ... 178, 179
Corrosion Services Incorporated ... 220
Crane Co. ... 54, 55

D

Darling Valve and Mfg. Co. ... 181
Davison Chemical Company Division of W. R. Grace & Co. ... 42
Delta Air Lines ... 213
Dover Corporation— The W. C. Norris Manufacturer Division ... 80, 215
Dow Corning Corporation ... 53
Dowell ... 195, 203, Inside Back Cover
du Pont ... 2, 20, 35

E

Edward Valves, Inc. ... 17
Elliott Company ... 75

F

Federal-Mogul Service Division of Federal-Mogul-Bower Bearings, Inc. ... 66
First National Bank & Trust Co. of Tulsa ... 12
Flight Refueling, Inc. ... 197
Foster Wheeler Corporation ... 140, 141
Foxboro Company, The ... 182, 183
Franks Division of Cabot Corporation ... 61

G

Gates Rubber Co., The ... 57
General Controls ... 117
General Electric Company ... 111
General Geophysical Company ... 8
General Services Administration ... 218
Geophysical Service, Inc. ... 204
Goodall Rubber Company ... 76
Goodrich Chemical Company, B. F. (Hycar) ... 7
Grace & Co., W. R.— Davison Chemical Division ... 42
Gray Tool Company ... 162
Guiberson Corporation ... 22
Gulf Oil Corporation ... 195

H

Halliburton Company ... Inside Front Cover, 3, 78, 79
Harrisburg Steel Co. ... 203
Houdry Process Corporation ... 146
Huey & Co., S. E. ... 177
Hughes Tool Co. ... Back Cover
Humble Oil & Refining Co. ... 5
Hutchison Manufacturing Company ... 216

I

International Harvester Co. ... 43
International Nickel Company, Inc., The ... 90

J

Jefferson Chemical Company, The ... 74
Johnston Testers, Inc. ... 10
Jones & Laughlin Supply Division ... 164, 165

K

Kelley Co., Inc., Ben F. ... 215
Kemp Mfg. Co., C. M. ... 158
Kidde & Company, Inc., Walter ... 213
Koppers Co., Inc. ... 196

L

Larkin Packer Company, Inc. ... 27
Link-Belt Company ... 32
Lone Star Steel Company ... 144, 145

M

Manning, Maxwell & Moore, Inc. ... 21, 86, 199
Marsh Instrument Company, Division of Colorado Oil and Gas Corporation ... 46
Martin-Decker Corp. ... 191
Martin, Manufacturer, John N. ... 197
Mayo Hotel, The ... 177
McDonough Marine Service ... 218
Mercantile National Bank ... 84
Mid-Continent Supply Company ... 38, 39
Minneapolis-Honeywell Regulator Co., Industrial Division ... 44, 45
Mission Mfg. Company ... 13
Morse Chain Company, A Borg Warner Industry ... 64
Motorola Communication & Electronics, Inc. ... 175
Mud Control Laboratories ... 218
Mueller Co. ... 30

N

Nalco Chemical Company ... 65
National Bank of Commerce, The ... 26
National Bank of Tulsa ... 58
National Lead Company ... 67, 68
National Tank Company ... 236
Nordstrom Valve Division, Rockwell Manufacturing Company ... 62, 63
Norris Manufacturer, W. C., Division of Dover Corporation ... 80, 215

O

Oil Well Supply Division ... 4
Orbit Valve Company ... 150
Otis Engineering Corporation ... 24, 188

P

Peerless Pump Division of Food Machinery & Chemical Corporation ... 156, 157
Petroleum Electric Power Assn. ... 25
Pfizer & Co., Inc., Chas. ... 153
Porter Company, Inc., H. K.— Thermoid Division ... 85
Procon Incorporated ... 201

R

Raybestos-Manhattan, Inc. ... 190
Refinery Supply Co., The ... 190, 191
Republic Rubber Division of Lee Rubber & Tire Corp. ... 202
Republic Steel Corporation ... 136, 137, 138
Ridge Tool Company, The ... 84
Robbins & Myers, Inc. ... 221
Rockwell Manufacturing Company ... 41
Roebling's Sons, John A.—Division of The Colorado Fuel and Iron Corporation ... 226
Roper Hydraulics, Inc. ... 180

S

Sheffield Division, Armco Steel Corporation ... 72
SKF Industries, Inc ... 214
Socony Mobil Oil Company, Inc. ... 160, 161
Solar Aircraft Company, A Subsidiary of International Harvester Company. ... 69
Standard Oil Company of Indiana ... 133
Stephens Engineering ... 218

T

Teletype Corporation, Subsidiary of Western Electric Company, Inc. ... 134
Texas Employers Insurance Association ... 59
Thermoid Division, H. K. Porter Company, Inc. ... 85
Thornhill-Craver Co. ... 56
Timken Roller Bearing Company ... 29

U

Union Carbide Chemicals Company, Division of Union Carbide Corporation ... 14
Union Wire Rope Corporation ... 206, 207
United States Steel Corporation— Oil Well Supply Division ... 4
Universal Oil Products Company ... 40, 70, 71

V

Viking Pump Company ... 219
Visco Products Co., Inc. ... 49
Vogt Machine Co., Henry ... 52

W

Wall Colmonoy Corporation ... 219
Warner Lewis Company ... 108
Wedgeping Valve Company Division of Stockham Valves and Fittings ... 37
Well Equipment Mfg. Corp. ... 189
Western Plastics ... 191
Western Supply Company ... 181
Williams & Co., J. H. ... 11
Williamson, Inc., T. D. ... 176
Wisconsin Motor Corporation ... 217
W-K-M Division of ACF Industries Incorporated ... 47
Worthington Corporation ... 149, 200

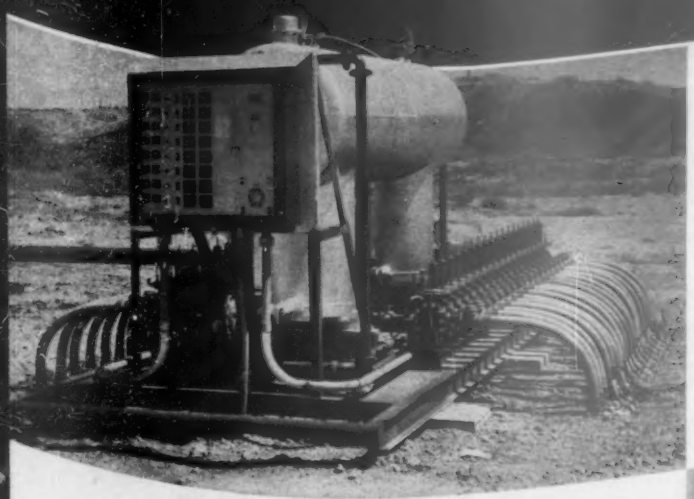
Z

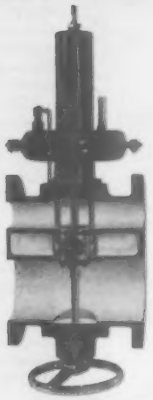
Zink Company, John ... 194

NATIONAL®

Packaged Well Test Unit

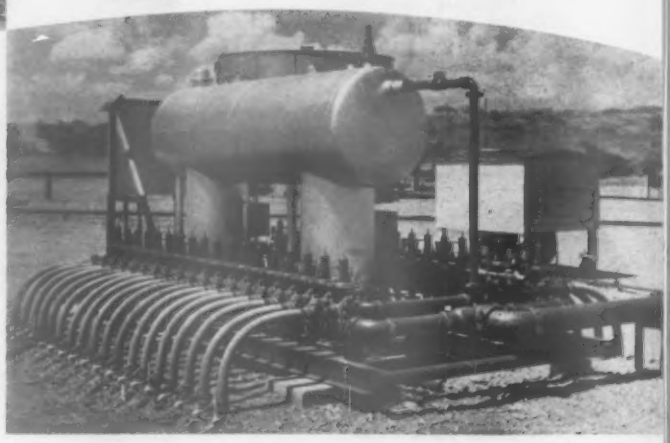
"Tests Better Automatically"





National MANI-FLO® Valves make this compact unit possible. MANI-FLO Valves require no lubrication and no expensive well-headers. When bolted together, MANI-FLOS are their own well-header and test line . . . self-contained . . . — Unique!

PATENT APPLIED FOR



AUTOMATICALLY DIVERTS FLUID STREAMS FROM WELLS, THEN SEPARATES, MEASURES, AND RECORDS QUANTITIES

- Automatically programs each of 36 wells in sequence for scheduled test.
- Separates oil, gas, and water.
- Measures the oil and water in the National Type B Liqua-Meters located in the legs of the National O-G-W MONOTUBE® SEPARATOR.
- Accumulates the volume of each product on the reset counters on the control panel.
- Strip Chart Recorder records production in relation to time.
- Separated products commingled and returned to the production line after test.
- Electric control panel actuates the pneumatic operated MANI-FLO valves to place well on test or production.
- Pictured unit does not measure or record gas production, but facility may be added at nominal cost on the same skid.
- Any power failure diverts all valves to production.
- Wells may be shut in manually with handwheel on bottom of MANI-FLO valve.

CONTROL PANEL
Weatherproofed and rain shielded. Clear plastic window allows complete visibility of all counters, well selector switches, and Strip Chart Recorder. Light indicates well on test.

STRIP CHART Recorder indicates:
Best production hours.
If well is flowing and/or surging.
Proper operation of pumping well.
Accurate well performance.

A Plus Value With All National Products . . . Engineers and field crews living in your area with stocked warehouses, complete units or parts ready to size, install and service National Well Test Units!

It's a National®

NATIONAL TANK COMPANY

DRAWER 1710
TULSA, OKLAHOMA

SECONDARY RECOVERY-- EVEN MORE PROMISING WITH DOWELL'S NEW IDEAS!

Many of the tools, techniques and products recently developed by Dowell for improving well stimulation treatments are being used effectively in *secondary recovery* operations. For example, *Rockshock** — a new service using implosion capsules to lower injection pressures; *Abrasijet** — a service used to clean the formation face and condition the zone for better fluid acceptance; *Ezeflo** — a low-pour-point surfactant used to lower water injection pressure; *Slick Water* — a friction-reducing agent used to cut pumping pressures by more than half during stimulation treatments; and a special agent used to remove calcium sulfate and other scale deposits from formations and down-hole equipment. These are only a few of Dowell's new services and products — more new ideas are on the way. If you're involved in secondary recovery work, it will pay you to *dial Dowell.* Dowell, Tulsa 1, Oklahoma.

*DOWELL TRADEMARK

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

IMPORTANT NEW DEVELOPMENT

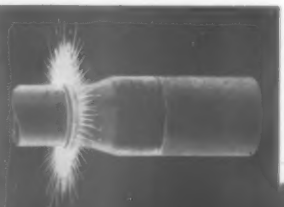
NOW! You can get Hughes "Flash-Weld" Joints on High-Strength pipe

A process for flash-welding tool joints to HIGH STRENGTH drill-pipe (pipe with a minimum yield strength of more than 80,000 p.s.i.) has been developed by Hughes. Intensive metallurgical research and the close co-operation of the pipe mills were required to solve some of the problems involved.

In developing the new process, HIGH STRENGTH drill-stem assemblies were subjected to repeated fatigue tests, and to a long series of tension-impact drop tests. In the latter, axial impact energy of more than 400,000 foot pounds was applied by the Hughes-built drop tester.

This new HUGHES process produces the ultimate balance in strength and ductility in the weld area.

FLASH-WELD
A DEVELOPMENT
OF
HUGHES
TOOL COMPANY
HOUSTON, TEXAS



HIGH STRENGTH drill-pipe, unitized with Hughes "Flash-Weld" tool joints, assures you the most dependable drill-stem for extra deep drilling.